

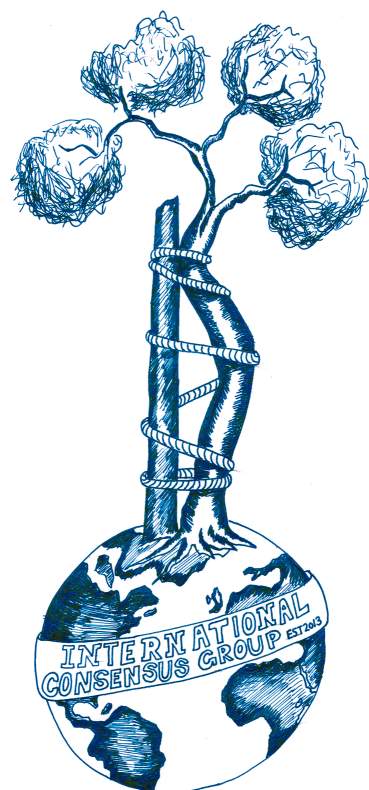
# 整形外科領域の 静脈血栓塞栓症(VTE)に おける 国際コンセンサス

Recommendations of the International Consensus  
Group on Venous Thromboembolism After  
Orthopaedic Procedures

Director : Javad Parvizi, MD, FRCS.

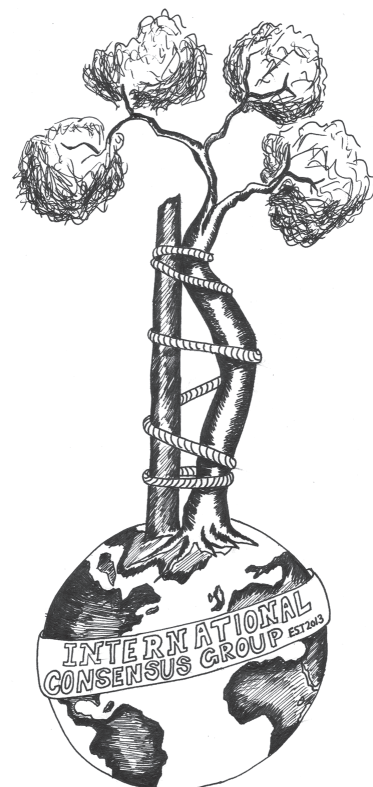
ICM翻訳プロジェクトチーム

INTERNATIONAL CONSENSUS  
MEETING (ICM) on VENOUS  
THROMBOEMBOLISM



# 整形外科領域の 静脈血栓塞栓症(VTE)に おける 国際コンセンサス

Recommendations of the International Consensus  
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# 日本語翻訳書発刊にあたって

国際コンセンサス会議（International Consensus Meeting: ICM）は、The Rothman Institute の Parvizi 先生が中心となり、2013 年 8 月に人工関節周囲感染（periprosthetic joint infection: PJI）の予防・診断・治療に関して世界的基準を作成する目的で米国・フィラデルフィアにて開催されました。その成果は、Proceedings of the International Consensus Meeting on Periprosthetic Joint Infection として発刊され、わが国においても PJI 診療に多大な影響を与えました。その後、2018 年 7 月には第 2 回 ICM が米国・フィラデルフィアで行われましたが、その範囲を PJI から筋骨格系感染（musculoskeletal infection）に拡大し、Delegates も全世界から 800 人以上の規模となり、成果物である Proceedings of the Second International Consensus Meeting on Musculoskeletal Infection は全世界の整形外科感染対策に対してさらに大きなインパクトを与えました。

この度、整形外科術後合併症として感染と並んで大きな問題である静脈血栓塞栓症（venous thromboembolism: VTE）に関して ICM が行われ、その成果物として Recommendations of the International Consensus Group on Venous Thromboembolism After Orthopaedic Procedures が The Journal of Bone and Joint Surgery (JBJS) から発刊されました（図 1）。この VTE に関する ICM の発足にあたっては、2021 年 2 月に Parvizi 先生より「VTE に関する ICM を行いたいので steering committee member として参加してくれないか」とのメールがあり、始まりました。Delegates は、各学会からの推薦や VTE に関する業績（3 編以上の論文など）などを基準に全世界から 600 名近くの専門家が選出され、日本からは 12 名の Delegates に参加していただきました。コロナ禍のため対面の会議はなく、作業は全てオンラインで行われましたが、わずか 1 年という短期間で Proceedings は完成し、2022 年 3 月に JBJS から発刊となりました。



図 1. The Journal of Bone and Joint Surgery (JBJS) から発刊された本書の原作

その後、以前の感染に関する ICM と同様に、この英語での Proceedings を各国の言語に翻訳して全世界に広めて役立てたいとの Parvizi 先生の強い希望により、日本語版翻訳書の作成を開始しました。ただ今回は原著が JBJS から発刊されているため、著作権などの問題により翻訳書の販売はできず、無償での配布を行うことになりました。そのため本翻訳書は、ICM 翻訳プロジェクトチームの先生方の多大なるご協力のもと、Parvizi 先生（The Rothman Institute）からの助成金と一般社団法人横浜整形外科研究推進機構からの助成金により作成いたしました。なるべく多くの全国の医療機関に配布させていただきましたが、数に限りがあるため ICM Philly のホームページ、アプリからもお読みいただけますので、ご利用いただければ幸いです（図 2）。



図2. ICM Philly ウェブサイト  
(<https://icmphilly.com/>)



スマホ用アプリ  
(Google Play 版、Apple 版)

整形外科領域における VTE に関する代表的なガイドラインは、海外では 2011 年に AAOS (American Academy of Orthopaedic Surgeons) からの改訂版、2012 年に ACCP (American College of Chest Physicians) からの第 9 版ガイドラインが、日本では 2017 年に日本整形外科学会静脈血栓塞栓症予防ガイドラインが発刊されて以降、発表されておりません。そのような中で、この Recommendations of the International Consensus Group on Venous Thromboembolism After Orthopaedic Procedures は New England Journal of Medicine の Guideline Watch 2022 に取り上げられております (図3)。



図3. New England Journal of Medicine 「Guideline Watch 2022」 P.15

VTE は現在でも整形外科領域では大きな問題ですので、本書が臨床現場で少しでもお役に立つことを心から願います。最後に、本書の作成にあたり原稿の管理、推敲をはじめ多大な尽力をいただいた横浜市立大学整形外科学教室秘書の斉藤志保さん、菅波彩佳さんに心より感謝いたします。

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稲葉 裕

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## 謝 辞

本書の制作にあたり、教育助成金を通じて多大なるご支援を賜りました Cardinal Health 社に心から感謝申し上げます。

おかげさまで生物統計学者や司書など、様々な分野からの協力を賜ることができました。



本書のような大規模な構想は、運営委員会による洞察力に富んだ助言やリーダーシップなしには叶いませんでした。運営委員会は度重なる電話会議やメール連絡を通じ、Delegates や学会の選定や質問の完成など、デルファイ過程の最終化に向け適切な計画を練り上げてくれました。そうして完成までのおよそ一年間、全ての手順に関わっていただきました。

組織委員会のメンバーは、数々の対面会議や毎週行われた電話会議を通じ、デルファイ過程の様々な手順を割り出し、スケジュールを作成してくれました。また、司書や疫学者の協力のもと、MeSH 用語の作成や、文献検索、Delegates とのコミュニケーション方法の確立を図り、デルファイの要件をすべて満たした包括的な文書をタイムリーに作成できるよう、熱心に取り組んでくれました。そして、JBJS に本書を提出する最終日まで文献のスクリーニングを続け、2021 年度に出版されたすべての論文が漏れなく含まれているよう尽力してくれました。また、未完の作業があれば、あらゆる場面でサポートに入り、完了するよう手助けしていただきました。そして出版社に入稿する前にすべての文書を査読し、評価していただきました。中でもとりわけ、Rothman Institute の研究部長である Camilo Restrepo MD は、入稿した文書が出版要件をすべて満たすよう、JBJS への対応を精力的にこなしてくれました。

Mesh 用語の探索、文献検索、データ抽出などの重要かつ広範な作業は、Stavros G. Memtsoudis MD が率いるニューヨークの疫学・生物統計学者チームや、合意プロセスの専門家として世界的に評価される Crispiana Cozowicz 氏、Jashvant Poeran MD, PhD、フィラデルフィアのチームの Matthew B. Sherman BS や Kerri-Anne Ciesielka MPH、そして Thomas Jefferson 大学の Scott Memorial 図書館の多くのスタッフ、とりわけ Abby Adamczyk MLIS, AHIP、Larissa Gordon MS, MEd, MA、Paul Hunter DMD, MLIS、Gary Kaplan MSLIS, AHIP、Gregory Laynor MLS, PhD、Rebecca Miller MLS などの皆様の監修のもと行われました。

しかし、その作業量は膨大なものとなり、新たにイタリアに協力を仰ぐこととなりました。MeSH 用語の作成、文献の検索、および本書の完成のため、多大なるご協力を賜りました Medical Sciences Research Academy (MSRA) の皆様、特に Matteo Spezia 氏、Susanna Sammali 氏、Gabriele Schiaffini 氏、Vittorio Oteri 氏、Veronica Iascone 氏、Tommaso Recchioni 氏、Simone Franceschini 氏、Michael Rodriguez 氏、Gaetano Russo 氏、Federica Campana 氏、Diana Alexa 氏、Carlotta Parati 氏、Anna Martinelli 氏、Alberto Bonato 氏、Matilde Pavan 氏、Marina Macchi 氏に心から感謝の意を表します。

ICM 本部の Tiffany Morrison MS, CCRP には、カーディナルヘルス社から提供された教育助成金の管理の取りまとめや、倫理、学術、財務面でのコンプライアンスを確保できるようその過程を監査いただいたことに感謝いたします。

Nicole Errico 氏には、Delegates との連絡や投票調査の管理など、事務処理にご協力いただき感謝いたします。

最後に、ウェブサイトの調整や管理に尽力いただきました Kristen Nicholson PhD に感謝の意を表します。

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- American Venous Forum (AVF)
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- Arthroplasty Society of Australia (ASA)
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- Australian Knee Society
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- Belgian Orthopedic Association
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- Brazilian Association for the Study of Implants and Osteoarticular Infections
- Brazilian Society of Orthopedics and Traumatology (SBOT)
- British Orthopedic Foot and Ankle Society (BOFAS)
- British Hip Society
- British Knee Society
- Bulgarian Orthopedic Association
- Canadian Orthopaedic Association (COA)
- Cervical Spine Research Society (CSRS)
- Chilean Society of Hip Surgery
- Chinese Orthopedic Association (COA)
- Colombian Orthopedic Association  
(Sociedad Colombiana de Cirugía Ortopédica y Traumatología) (SCCOT)

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- Dutch Federation of Medical Specialists
- Ecuadorian Orthopedic Association (SEOT)
- Egyptian Orthopedic Association
- Emirates Orthopedic Society
- European Bone and Joint Infection Society
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- European Knee Society (EKS)
- European Musculoskeletal Oncology Society
- European Society for Regional Anesthesia (ESRA)
- European Society for Sports Traumatology Knee Surgery and Arthroscopy (ESSKA)
- European Venous Forum
- European Foot and Ankle Society
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- Hellenic Hip Society
- Hellenic Knee Society
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- Italian Orthopedic Association

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- Mexican Hip Society
- Mexican Orthopedic Association
- Musculoskeletal Tumor Society (MSTS)
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- Nigerian Orthopedic Association
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- Orthopedic Trauma Association (OTA)
- Osteosynthesis and Trauma Care Foundation (OTC)
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- Pan Arab Orthopaedic Association
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# 整形外科領域の静脈血栓塞栓症（VTE） 国際コンセンサス Delegates リスト



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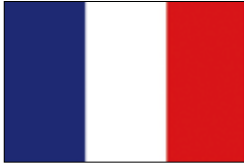
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## Foot & Ankle

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## Hand & Wrist

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## Hip & Knee

|      |                                                                                     |     |
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## Oncology

### 骨転移における VTE

|      |                                                                                            |     |
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|      |                                                                                              |     |
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## Pediatric

|      |                                                            |     |
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## Shoulder & Elbow

|      |                                            |     |
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## Sports

|      |                                                         |     |
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# 整形外科領域の静脈血栓塞栓症 (VTE) における 国際コンセンサス

## — Editorial —

「整形外科手術を受ける患者は、静脈血栓塞栓症 (VTE) による死亡リスクが高まる。」この見解を実証するエビデンスは、現代の整形外科の医療現場において極めて僅かしかないものの、整形外科領域の VTE 問題を検証した論文には度々見られる記述です (図 1)。このような見解により、医師と患者の双方において、長年 VTE による弊害や死亡に対する怖れが常態化してきました。そのため、米国整形外科学会 (AAOS) や米国胸部医学会 (ACCP) をはじめ、世界中の数多くの機関で、整形外科領域における VTE に関するガイドラインが作成されています。

しかしながら、VTE に関する既存のデータは不足しています。従ってこれらのガイドラインがいくつかの根拠により批判されてきたのは当然のことと言えます。多くのガイドラインが、その適用範囲を特定の手術手技 (THA / TKA など) に限定しており、なかには VTE に対する地理的および人種的要因の重要性を軽視したものもあります。また、ほとんど全てのガイドラインにおいて、優先的あるいは独占的に質の高い研究のみに依存した推奨が作成されています。これは方法論的には間違っていないし評価にも値するのですが、一方で、製薬会社が新しい予防薬の臨床使用を承認してもらうため、規制要件の一部として実施した研究まで含まれてしまう結果となりました。このような研究では、多くの場合、静脈造影により検出される遠位 VTE 発生率の違いの評価には力を注いでいますが、医師や患者にとって真の懸念であり、臨床的にも重要である症候性 VTE や稀な致死性肺塞栓症 (PE) の評価が乏しくなっています。一部のガイドラインにおいては、これら新薬の投与が元凶となりうる合併症 (出血、創傷関連の合併症や感染症など) を見落とししており、その結果、医療保険制度の莫大なコストや患者の死亡をもたらしていると批判されています。

国際コンセンサス会議 (ICM) は、こうした現状のガイドラインの限界を認識し、バイアスが無く臨床的に重要なエンドポイントを持つランダム化試験が必要であると考えました。そこで、世界中から専門家を招集し、現実の問題に対処するための指針や推奨の作成を目指すこととなりました。招集された Delegates の属性は全 68 カ国、さまざまな国際学会や専門分野 (麻酔科・心臓病学・血液学・内科・整形外科) に及び、整形外科の全ての領域を網羅した実践的かつ世界的に通用する推奨を作成すべく、システマティックレビュー形式による綿密な文献調査が行われることとなりました。この壮大なプロジェクトに参加した専門家はおおよそ 600 名、これまでの ICM 活動と同様、厳格な Delphi (デルファイ) 法に倣って生み出されたのが、現在手にされているこの記念すべき一冊です。1 年間にわたる運営委員会による厳格な指導や、組織委員会・司書・生物統計学者・疫学者・Cochrane グループからの専門家らの協力を経て、整形外科領域の VTE に関連するすべての文献がレビューされ、医療現場から集約された 200 件近くの課題 (質問) に対する回答や推奨が作成されました。

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07 September 2021

Dear Javad

**Reference: ICM VTE work and subsequent publication**

As we have discussed I commend you for the organisation of this work and for cracking the whip to get it done so relatively quickly – it took us over two years to get to almost the same point when I was involved doing the same work in the UK for NICE!

The outcome from the ICM VTE consensus group has essentially concluded that the scientific evidence to guide the medical community globally on VTE prevention in Trauma & Orthopaedic surgery is generally of poor quality / low GRADE.

The current research has shown that there is presently no good evidence that any thromboprophylaxis strategy will protect against fatal pulmonary embolus. That does not mean however that we should not attempt to limit the chances with a common sense and risk stratification approach.

There is no current good evidence for a validated risk analysis and assessment stratification tool in Trauma & Orthopaedic surgery. This should be an item of priority research. Patients should undergo some form of risk analysis, be advised accordingly and get good impartial advice informing them of all the risks and benefits. Everything we do, prescribe or give to a patient has a risk:benefit ratio. We all get a skewed view of life in our own speciality and sub-speciality silos. Chemical thromboprophylaxis is not without its risks. In our own small unit not infrequently we have a patient on our acute Trauma lists who requires urgent surgery as a direct result of the complications of chemical thromboprophylaxis. Our views have been coloured by the results of studies that use "surrogate end points" – non clinically apparent VTEs that we would be unaware of and would also often not treat if the patient is asymptomatic. We are aware that these surrogate end points may occur at least a factor of ten, and sometimes a factor of 100, greater than the clinical events. Post-phlebotic syndrome does not occur as often as has been suggested in some of the medical literature. Asymptomatic VTEs in a patient population over the age of 60 in high income countries, particularly lower limb DVT, is rarely reported and may approach 16% (Gabriele Ciuti et al: Thromb Res 2012). We need to "live in the real world" and factor in the risks: "First do no harm".

We should also recognise that we are most unlikely to ever be able to get good level 1 evidence in this clinical area. If we are dealing with a clinical event that may occur 1%, or less, of the time: to be able to conduct a properly designed and powered two arm clinical trial, that uses clinical and not surrogate end points, depending on the outcome being evaluated, will require a study patient population of 20,000 to 90,000. This is most unlikely to ever be achieved and particularly as we will need multiple studies like this and trials that will involve more than two arms – making them even less achievable. This being the case a global agreement must be reached that all studies, databases and large audits (eg national audit databases, like the British National Joint Registry) must be included to be able to attempt to come to a global consensus on the best possible advice to the medical community, and public, on the best VTE prevention strategies.

What are my credentials for making these comments?: I have been a member of a UK National Institute of Health & Care Excellence (NICE) committee on VTE. I am a clinical trials review panel member for the UK National Institute of Health Research (NIHR). I am a Past (& Founding) President of the Orthopaedic Trauma Society and am an Emeritus International member of the Orthopaedic Trauma Association. I also: Chair Incision Medical Indemnity: insuring ~1000 surgeons, Chair the Primary Trauma Care Foundation and sit on the G4 Alliance strategic board advocating for Trauma care globally.

Kindest regards



NIGEL D ROSSITER

図 1. Dr. Nigel Rossiter からの手紙

Delegates の任命基準につきましては、各学会から推薦を受けた方々、もしくは本件に関する論文実績（VTE に関する出版済み論文が 3 件以上）に基づき任命されました。各質問はそれぞれ 2 名の Delegates に割り当てられ、司書により MeSH（メッシュ）用語や時には論文リストが提供されました。作業を共同で行うか、もしくは個別に進めるかは各 Delegate に委ねられました。そうして 6 ヶ月にも及ぶ文献のレビューとデータの抽出を経て、推奨の初稿が作成され、各分野に精通した 1～2 名の別の Delegates によりレビューされました。この初回レビューによる批評や指摘は著者に返送され、改訂された原稿は別の Delegates により 2 度目のレビューを受けました。この間、改訂中の原稿は常時 ICM のウェブサイトに掲載され、誰もが閲覧しコメントできる仕様となっており、そうして寄せられたコメントはすべて担当の Delegates と共有されました。

その後、The Journal of Bone and Joint Surgery (JBJS) に入稿する前にも、追加で二回のレビューが行われました。ICM 組織委員会のメンバーによる原稿の最終確認が一回、各整形外科領域の担当編集者によるレビューが一回です。そうして投稿された原稿は、JBJS の通常の査読を経て、ようやく印刷の日の目を見ることとなったのです。

この膨大な作業は、多くの人々の犠牲や献身なくして、これ程短期間で達成することは不可能でした。とりわけ、無私無欲に貴重な時間を捧げ、迅速かつ完璧に作業を遂行してくださった世界中の Delegates に深い感謝の意を表します。そして、その他多くの方々（謝辞参照）の多大な貢献なくして、この壮大な構想を実現することは叶いませんでした。こうして完成した本書が、今後何年にもわたって患者や医療現場に役立ってくれることを私どもは願っています。

*Marc Swiontkowski, MD*

Editor-in-Chief

*Javad Parvizi, MD*

Consulting Editor for Research

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## 略語一覧

| 略 語    | 原 文                                       | 和 訳         |
|--------|-------------------------------------------|-------------|
| CVC    | central venous catheter                   | 中心静脈カテーテル   |
| DOAC   | direct oral anticoagulants                | 直接阻害型経口抗凝固薬 |
| DVT    | deep venous thrombosis                    | 深部静脈血栓症     |
| ICD    | intermittent compression device           | 間欠的圧迫装置     |
| INR    | international normalized ratio            | 国際標準化比      |
| IPC    | intermittent pneumatic compression        | 間欠的空気圧迫法    |
| IPCD   | intermittent pneumatic compression device | 間欠的空気圧迫装置   |
| LMWH   | low-molecular-weight heparin              | 低分子量ヘパリン    |
| MBE    | major bleeding event                      | 大量出血イベント    |
| MCD    | mechanical compressive device             | 機械的圧迫装置     |
| NSAIDs | non-steroidal anti-inflammatory drugs     | 非ステロイド性抗炎症薬 |
| PCD    | pneumatic compression device              | 空気圧迫装置      |
| PE     | pulmonary embolism                        | 肺塞栓症        |
| PJI    | periprosthetic joint infection            | 人工関節周囲感染    |
| RCT    | randomized controlled trial               | 無作為化比較試験    |
| THA    | total hip arthroplasty                    | 人工股関節全置換術   |
| TJA    | total joint arthroplasty                  | 人工関節全置換術    |
| TKA    | total knee arthroplasty                   | 人工膝関節全置換術   |
| TXA    | tranexamic acid                           | トラネキサム酸     |
| UFH    | unfractionated heparin                    | 未分画ヘパリン     |
| VKA    | vitamin-K antagonist                      | ビタミン K 拮抗薬  |
| VTE    | venous thromboembolism                    | 静脈血栓塞栓症     |



PART I

# General

<監訳者>

赤木 将男、池 裕之、稲葉 裕、大島 康史、尾崎 敏文、湊藤 啓広、手塚 太郎、新倉 隆宏、  
長谷川 正裕、眞島 任史、山田 和希



**CQ 1 : 特定の患者は他の患者よりも VTE リスクが高いか？**

著者 : Jeremiah Taylor, William Jiranek, Jerzy Bialecki, Ronald Navarro 翻訳者 : 湊藤啓広

推奨 : 特定の患者層は、VTE リスクが高いことが確認されている。

エビデンスレベル : Limited

投票結果 : 賛成 94.63%、反対 2.93%、棄権 2.44% (強いコンセンサス)

**CQ 2 : VTE の遺伝的素因はあるか？**

著者 : Jennifer A. Bell, Michael H. Huo, Jay R. Lieberman 翻訳者 : 湊藤啓広

推奨 : VTE の遺伝的素因を持つ典型的な血栓症は 5 つある。VTE の遺伝的危険因子の大部分は未発見であり、VTE リスクに関連する多くの新しい遺伝子座が同定され続けている。

エビデンスレベル : Strong

投票結果 : 賛成 98.60%、反対 0.47%、棄権 0.93% (強いコンセンサス)

**CQ 3 : 整形外科手術を受ける患者において、年齢と VTE リスクに相関はあるか？**

著者 : Karsten Keller, Lukas M.A. Hobohm 翻訳者 : 湊藤啓広

推奨 : 整形外科手術を受ける患者では、年齢の上昇に伴い、術後の VTE リスクが高まる。

エビデンスレベル : Strong

投票結果 : 賛成 99.53%、反対 0.47%、棄権 0.00% (強いコンセンサス)

**CQ 4 : 整形外科手術後の VTE リスクは民族や人種と関係があるか？もしそうであれば、VTE 予防策は人種や民族に基づいて変更すべきか？**

著者 : David O. Alfaro, John Callaghan, Ronald Navarro 翻訳者 : 湊藤啓広

推奨 : 現時点では、VTE 予防策を人種／民族によって変更すべきと示唆するエビデンスは不十分である。

エビデンスレベル : Limited

投票結果 : 賛成 95.12%、反対 2.44%、棄権 2.44% (強いコンセンサス)

**CQ 5 : 肥満度 (BMI) と VTE の間に明確な関連性はあるか？**

著者 : Ana Torres, Emanuele Chisari, Jessica Morton, Emilio Romanini, Vitali Goriainov, Nicola Gallagher, Rajiv Kaila, Antonio J. Andrade, David Beverland 翻訳者 : 湊藤啓広

推奨 : 手術などの影響に起因しない VTE と BMI の増加との間に明確な関連性があることは、広範なエビデンスによって確認されている。しかし、BMI と術後 VTE を関連付けるエビデンスは、より曖昧である。

エビデンスレベル : Moderate

投票結果 : 賛成 95.15%、反対 3.88%、棄権 0.97% (強いコンセンサス)

**CQ 6 : VTE の既往は、整形外科手術を受ける患者の術後 VTE 発生率に影響するか？**

著者 : Leanne Ludwick, Noam Shohat 翻訳者 : 内藤陽平

推奨 : DVT や PE を含む VTE の既往のある患者では、整形外科手術後の VTE 発生率を高める。

エビデンスレベル : Strong

投票結果 : 賛成 99.51%、反対 0.00%、棄権 0.49% (強いコンセンサス)

**CQ 7 : VTE の既往における種類 (DVT vs PE) や時期 (過去 vs 最近) は、整形外科手術後の VTE リスクに影響するか？**

著者 : Brendan Gleason, Camilo Restrepo, William J. Hozack 翻訳者 : 内藤陽平

推奨 : VTE の既往を有する患者において、手術後の VTE リスクが増大するという考えは妥当であるが、過去の VTE の種類や時期が手術後の VTE リスクに与える影響について記載された質の高い文献はほとんどない。

エビデンスレベル : Limited

投票結果 : 賛成 93.60%、反対 3.45%、棄権 2.96% (強いコンセンサス)

**CQ8: 感染症（局所または全身性）に罹患している患者において、整形外科手術後の VTE リスクは増大するか？**

著者: Mohammad T. Ghazavi, Asep Santoso, Francesco Zambianchi, Fabio Catani 翻訳者: 内藤陽平

**推奨:** 全身性感染症に罹患している患者において、整形外科手術後の VTE リスクは増大する。局所感染との関連性は不明である。**エビデンスレベル:** Moderate**投票結果:** 賛成 95.07%、反対 2.46%、棄権 2.46% (強いコンセンサス)**CQ9: 静脈瘤または表在性下肢静脈血栓症は、整形外科手術を受ける患者の VTE リスクを増大させるか？**

著者: David Campbell, Kirill Lobastov, Zbigniew Krasinski 翻訳者: 内藤陽平

**推奨:** 静脈瘤を有する患者において、高リスクな整形外科手術後の VTE リスクは約 3 倍高くなる (Strong)。表在性静脈血栓症 (SVT) の既往は、下肢整形外科手術を受ける患者の VTE リスクを 5～10 倍増大させる (Limited)。急性 SVT は、下肢整形外科手術を受ける患者の VTE リスクをさらに増大させるため、待機的整形外科手術は可能であれば最低 3 ヶ月は延期すべきである (Limited)。**エビデンスレベル:** Limited**投票結果:** 賛成 95.10%、反対 0.98%、棄権 3.92% (強いコンセンサス)**CQ10: (A) 経口避妊薬 (OCP) は VTE リスクを増大させるか？ (B) もし増大させるのであれば、整形外科手術前に中止すべきか？**

著者: Pedro Dantas, Suzanne C. Cannegieter, André Grenho, Sérgio Goncalves 翻訳者: 内藤陽平

**推奨:** OCP 使用中の女性は、使用していない女性に比べて手術後の VTE 発生率が高い。全ての使用者における中止は推奨されない。しかし、OCP 使用中であることを、患者および手術手技のリスク評価をする際に考慮に入れるべきであり、それに基づいた血栓予防の有無を決定すべきである。**エビデンスレベル:** (A) Strong; (B) Limited**投票結果:** 賛成 94.66%、反対 1.94%、棄権 3.40% (強いコンセンサス)**CQ11: がん治療に用いられる経口ホルモン療法は、整形外科手術を受ける患者の術後 VTE リスクを増加させるか？もしそうであれば、手術前に中止すべきか？**

著者: Salvador Oscar Rivero Boschert, José J. Aguilar Ramirez, Gregory Y.H. Lip 翻訳者: 刀根慎恵

**推奨:** タモキシフェンのようながん治療に用いられるホルモン療法は、整形外科手術を受ける患者の術後 VTE リスクを増加させる。少なくとも手術 7 日前よりホルモン療法を中止すべきであるが、危険因子や臨床背景 (がんの種類など) に応じて、ある程度個別に対応する必要がある。**エビデンスレベル:** Weak**投票結果:** 賛成 92.08%、反対 2.97%、棄権 4.95% (強いコンセンサス)**CQ12: 手術前に飛行機や車による長距離移動を行った患者は VTE リスクが高まるか？もしそうであれば、長距離移動から手術までの最適な間隔はどのくらいか？**

著者: Erik N. Hansen, David G. Nazarian 翻訳者: 刀根慎恵

**推奨:** 飛行機での移動、特に「長距離フライト」が VTE 発症の主要な危険因子であることはよく知られている。VTE 既往の危険因子を持つ患者は最もリスクが高いとされる。だが、手術前の長距離移動が術後 VTE リスクに及ぼす影響について検討した文献は少ない。同様に、術後急性期の飛行機での移動は VTE リスクが上昇するため避けるべきであると一般的に考えられているが、この考え方を支持するエビデンスは限られている。結論として、術前もしくは術後に長距離移動をする患者において、VTE リスクを軽減する最適な対策に関する文献は限られているため、予防策の選択は患者ごとに薬物的及び非薬物的選択肢の相対的リスクとベネフィットを考慮し、個別に行う必要がある。**エビデンスレベル:** Limited**投票結果:** 賛成 96.10%、反対 1.46%、棄権 2.44% (強いコンセンサス)

**CQ13: すべての整形外科手術は DVT に対し同じ危険因子を持つか?**

著者: Juan S. Sánchez-Osorio, Adolfo Llinás, Guillermo Bonilla, Cristina Suarez, Daniel Monsalvo, Ana Torres, Sudeep Shivakumar, Justin Magnuson, Chad A. Krueger 翻訳者: 刀根慎恵

**推奨:** 整形外科手術は DVT に対し様々な危険因子を有している。従来、整形外科手術は VTE の発生率に応じて層別化されてきており、中でも THA と TKA は股関節骨折手術と並んで最もリスクの高い手術となっている。

**エビデンスレベル:** Limited

**投票結果:** 賛成 98.52%、反対 0.49%、棄権 0.99% (強いコンセンサス)

**CQ14: 手術時間は術後 VTE 発生率に影響するか?**

著者: Emanuele Chisari, Graham S. Goh, Javad Parvizi 翻訳者: 刀根慎恵

**推奨:** 手術時間は VTE リスクの上昇と直接的に関連している。術中合併症や手術の複雑さが手術時間に影響する場合は、VTE リスクを再評価する必要がある。

**エビデンスレベル:** Moderate

**投票結果:** 賛成 98.07%、反対 0.48%、棄権 1.45% (強いコンセンサス)

**CQ15: 整形外科手術を受ける患者において術中出血量は術後 VTE 発生率に影響するか?**

著者: Alexander J. Acuña, Andy Kuo, Giedrius Kvederas, Atul F. Kamath 翻訳者: 刀根慎恵

**推奨:** この問題に関連する具体的なデータはない。しかしながら、同種血輸血と術後 VTE の間に関連がある可能性があるため、術中出血量や同種血輸血の必要性を減らすための対策を講じることを推奨する。

**エビデンスレベル:** Limited

**投票結果:** 賛成 97.56%、反対 0.49%、棄権 1.95% (強いコンセンサス)

**CQ16: 同種血輸血の投与は、整形外科手術を受ける患者の術後 VTE 発生率に影響するか?**

著者: Noam Shohat, Tony Tannoury, Giedrius Kvederas 翻訳者: 中川晃一

**推奨:** 主に TJA の文献からではあるが、大多数の臨床研究が、整形外科手術後の同種血輸血と VTE との関連性を挙げている。この関連性には、周術期における同種血輸血の使用を最小限に抑えるよう外科医に促すに十分な科学的根拠がある。

**エビデンスレベル:** Limited

**投票結果:** 賛成 95.10%、反対 1.47%、棄権 3.43% (強いコンセンサス)

**CQ17: 整形外科手術を受ける患者へのトラネキサム酸 (TXA) 投与は、その後の VTE リスクを増加させるか?**

著者: Armin Arish, Vasili Karas, George C. Babis, Jeffrey J. Mojica, Uzung Yoon, Yale A. Fillingham 翻訳者: 中川晃一

**推奨 (A):** VTE の既往のない患者において、整形外科手術を受ける際に TXA を投与しても、その後の VTE 発症リスクは増加しない。

**推奨 (B):** VTE 既往のある患者や同等の凝固亢進リスクのある患者において、整形外科手術を受ける際に TXA を投与しても、その後の VTE 発症リスクは増加しない。

**エビデンスレベル:** (A) Strong; (B) Moderate

**投票結果:** 賛成 97.06%、反対 0.98%、棄権 1.96% (強いコンセンサス)

**CQ18: 下肢へのターニケット使用は、術後 VTE 発生率に影響を与えるか?**

著者: Paul Sousa, Mahmoud A. Hafez, Matthew S. Austin 翻訳者: 中川晃一

**推奨:** 整形外科手術中の下肢ターニケットの使用と術後の VTE を関連づける十分なエビデンスはない。

**エビデンスレベル:** Limited

**投票結果:** 賛成 91.58%、反対 4.95%、棄権 3.47% (強いコンセンサス)

**CQ19: 上肢へのターニケット使用は、術後 VTE 発生率に影響を与えるか?**

著者: Surena Namdari, Samir Mehta 翻訳者: 中川晃一

**推奨:** 上肢の手術でターニケットを使用した場合、VTE 発生率は高くないようである。

**エビデンスレベル:** Limited

**投票結果:** 賛成 96.55%、反対 0.49%、棄権 2.96% (強いコンセンサス)

**CQ20: 整形外科手術を受ける患者の術後 VTE 予防に、術中ヘパリンは有効かつ安全か？**

著者: Sam Schulman, Alfredas Smalys, Nigel Sharrock 翻訳者: 中川晃一

**推奨:** THA を受ける患者への術中ヘパリン静脈内投与についてはこれまで研究されてきており、術後 VTE の予防に安全かつ有効であることが判明している。他の整形外科手術におけるこの方法の有効性を評価するためには、さらなる研究が必要である。

エビデンスレベル: Moderate (for hip)

投票結果: 賛成 84.06%、反対 8.70%、棄権 7.25% (強いコンセンサス)

**CQ21: 麻酔の種類は整形外科手術における VTE リスクに影響するか？**

著者: Stavros G. Memtsoudis, Crispiana Cozowicz, Eugene R. Viscusi 翻訳者: 山岸孝太郎

**推奨:** 脊髄幹麻酔 (脊髄くも膜下麻酔や硬膜外麻酔) の使用は、下肢関節形成術後の VTE リスクの低下と関連しており、多様の予防法の一部として考慮する必要がある。

エビデンスレベル: Moderate

投票結果: 賛成 94.58%、反対 2.46%、棄権 2.96% (強いコンセンサス)

**CQ22: 整形外科手術中の polymethyl methacrylate (PMMA) セメント使用は、その後の VTE 発生リスクに影響するか？**

著者: Louis M. Kwong, Yoshi P. Djaja, Brett Levine 翻訳者: 山岸孝太郎

**推奨:** PMMA セメントとその構成成分が in vitro で血栓形成性であることは実証されていないが、PMMA セメントの使用はその後の塞栓のリスクに確かに影響を与え、その一部は VTE と分類される場合がある。

エビデンスレベル: Moderate

投票結果: 賛成 84.77%、反対 9.64%、棄権 5.58% (強いコンセンサス)

**CQ23: 整形外科手術を受ける患者の術中体位は、その後の VTE リスクに影響するか？**

著者: William H. Geerts, Nicholas M. Siegel, Jose A. Canseco 翻訳者: 山岸孝太郎

**推奨:** 手術体位は、一部の整形外科手術後の VTE リスクに影響を与える可能性があるが、この問題に取り組んだ質の高い研究はない。術中体位は、VTE リスク軽減の戦略としてではなく、手術部位への最適なアプローチと展開、及び技術的専門知識に基づいて決定することを推奨する。

エビデンスレベル: Consensus

投票結果: 賛成 97.04%、反対 0.49%、棄権 2.46% (強いコンセンサス)

**CQ24: 整形外科手術を受ける患者の VTE リスク判定に使用できる、検証済みのリスク層別化スコアリングシステムはあるか？**

著者: Noam Shohat, Joseph A. Caprini, Pascal-André Vendittoli 翻訳者: 山岸孝太郎

**推奨:** 現在、すべての整形外科専門分野で使用できる検証済みのリスクスコアはない。リスクスコアに関する研究のほとんどは関節置換に関する文献に基づいており、概ね類似した危険因子を使用して、患者を高リスク・低リスクに分類している。だが残念ながら、これらのスコアはいずれも適切に検証されておらず、大量出血イベント (MBE) の評価も欠いている。さらに、これらのリスクスコアが患者の転帰と意思決定に与える影響についても不明のままである。これらの重要なリミテーションに対処するには追加の研究が必要である。

エビデンスレベル: Moderate

投票結果: 賛成 99.52%、反対 0.00%、棄権 0.48% (強いコンセンサス)

**CQ25: 整形外科手術後の大量出血イベント (MBE) を予測するためのリスク層別化システムはあるか？**

著者: Gulraj S. Matharu, Michael R. Whitehouse 翻訳者: 山岸孝太郎

**推奨:** 整形外科手術後の MBE を予測するために利用できる正式なリスク層別化システムはない。慢性経口抗凝固療法を受けている患者に限定された最近のコンセンサスでは、手術ごとに出血イベントのリスクを分類 (高リスク、中/低リスク、最小リスク) している。

エビデンスレベル: Consensus

投票結果: 賛成 98.07%、反対 0.48%、棄権 1.45% (強いコンセンサス)

## CQ26: 整形外科手術を受ける患者の出血リスクを層別化する意義はあるか? もしあるならば、出血リスク因子に基づき VTE 予防薬を変更すべきか?

著者: Ömer Serdar Hakyemez, Ibrahim Azboy 翻訳者: 小原良規

**推奨:** 整形外科手術後における大量出血イベント (MBE) の発生率と重篤な転帰を考えると、手術前のリスク層別化は間違いなく必要である。これまで VTE の危険因子の特定には多くの注意が払われ、このリスクを軽減するため様々なガイドラインが作られてきたが、MBE については深刻な合併症であるにもかかわらずあまり注視されてこなかった。そして悪いことに、MBE は二次的な結果としてみられることが多く、そのためコホートが小さすぎ、この問題を調査するのに十分な統計的検出力が得られない。現在の文献では、MBE リスクに関してある一つの予防薬を他の予防薬よりも支持する事はできないが、VTE リスクの軽減という潜在的メリットと、出血リスクの増加という潜在的デメリットとを天秤にかけ、検討することが重要である。

**エビデンスレベル:** Limited

**投票結果:** 賛成 97.21%、反対 0.93%、棄権 1.86% (強いコンセンサス)

## CQ27: トロンボエラストグラフィ (TEG) は、整形外科手術を受ける患者の VTE リスク予測に有用か?

著者: Christiaan N. Mamczak, Joshua L. Gary, Mark Walsh 翻訳者: 小原良規

**推奨:** TEG による VTE 予測は、過去に他の外科専門分野医師により有用であると実証されたが、整形外科手術を受ける患者では十分な臨床試験がなされていない。ただし、限られた研究ではあるが、最大振幅 (MA) > 65mm を基準とし、外傷や外科的介入後の凝固能亢進や VTE を整形外科的に評価する場合、TEG が有用な補助検査となる事が示唆されている。

**エビデンスレベル:** Moderate

**投票結果:** 賛成 89.74%、反対 1.54%、棄権 8.72% (強いコンセンサス)

## CQ28: TJA 後に発生した下肢 DVT は、PE を引き起こすか?

著者: Andrew J. Hughes, Emanuele Chisari, Javad Parvizi, Geoffrey Westrich, David Beverland 翻訳者: 小原良規

**推奨:** PE を引き起こす DVT の広がり、明らかな誘因のない血栓症患者で報告されており、個人の血栓形成の表現型に起因するとされている。PE が DVT から発生する可能性がある事は認識されているが、整形外科手術、特に TJA を受けた患者において、DVT の広がりとは PE との間に直接的な関係は認められない。

**エビデンスレベル:** Moderate

**投票結果:** 賛成 90.59%、反対 5.94%、棄権 3.47% (強いコンセンサス)

## CQ29: 手術後の近位 (膝窩や膝窩上) DVT 患者はどのように管理されるべきか?

著者: Andrew J. Hughes, Emanuele Chisari, Javad Parvizi 翻訳者: 小原良規

**推奨:** 整形外科手術を受けた患者において、膝窩や膝窩上の血管にある近位 DVT を急性発症した場合、現在のガイドラインに沿った治療を考慮することが推奨される。

**エビデンスレベル:** Moderate

**投票結果:** 賛成 98.54%、反対 0.97%、棄権 0.49% (強いコンセンサス)

## CQ30: 手術後の遠位 DVT 患者はどのように管理されるべきか?

著者: Karan Goswami, Brendan Gleason, Gregg R. Klein, William J. Hozack 翻訳者: 小原良規

**推奨:** 具体的な根拠には欠けるが、われわれの総意としては、孤立性の遠位 DVT 患者は、無治療あるいはアスピリン投与での経過観察が可能である。

**エビデンスレベル:** Limited

**投票結果:** 賛成 79.70%、反対 14.85%、棄権 5.45% (強いコンセンサス)

## CQ31: 整形外科手術後にヒラメ静脈血栓症が発見された患者はどのように管理されるべきか?

著者: William T. Li, Man Hong Cheung, Kenneth L. Urish 翻訳者: 池裕之

**推奨:** 整形外科手術後におけるヒラメ静脈血栓症の治療に関して、エビデンスレベルの高い文献はほとんどない。ヒラメ静脈の血栓が近位静脈へ進展する確率は非常に低い。したがって、これらの患者は、繰り返しの画像検査などによる綿密なモニタリングと、場合によってはアスピリンの投与によって管理されることが望まれる。

**エビデンスレベル:** Limited

**投票結果:** 賛成 89.11%、反対 6.93%、棄権 3.96% (強いコンセンサス)

**CQ32: 整形外科手術後に VTE が発生するのはいつか？**

著者: Leanne Ludwick, Ibrahim Tuncay 翻訳者: 池裕之

**推奨:** VTE の発生で最も重要な時期は、整形外科手術後の最初の 1 ヶ月以内であるが、VTE のリスクはそれより長く持続する可能性がある。**エビデンスレベル:** Limited**投票結果:** 賛成 97.56%、反対 0.98%、棄権 1.46% (強いコンセンサス)**CQ33: 下肢 DVT 患者は整形外科手術を受けるべきか？**

著者: Michael Meghpara, James J. Purtill, Paul Tornetta III, Felix Vilchez 翻訳者: 池裕之

**推奨:** 活動性の DVT または PE の患者における整形外科手術の安全性を支持するエビデンスは限られている。したがって、これらの患者の管理は、患者の病歴、手術手技、DVT / PE の範囲、生理学的パラメーター、手術中および手術後の出血リスクに基づいて個別に判断する必要がある。**エビデンスレベル:** Limited**投票結果:** 賛成 95.61%、反対 2.44%、棄権 1.95% (強いコンセンサス)**CQ34: DVT および／または PE と診断されてから、患者が待機的整形外科手術を受けることができるまでの期間はどのくらいか？**

著者: Kristen Combs, Augustus C. Demanes, Eleni Moka, Mary K. Mulcahey, Ronald Navarro 翻訳者: 池裕之

**推奨:** 明確なエビデンスはないが、最近診断された DVT および／または PE の患者では、待機的整形外科手術を 6 ヶ月遅らせる必要があるというのがわれわれの総意である。**エビデンスレベル:** Consensus**投票結果:** 賛成 88.61%、反対 7.43%、棄権 3.96% (強いコンセンサス)**CQ35: 整形外科手術を受ける患者の急性下肢 DVT を治療しないことによる悪影響はあるか？**

著者: Paul W. Ackermann, Mathias Granqvist, Gregg R. Klein 翻訳者: 池裕之

**推奨:** 既存のデータでは、近位下肢 DVT の患者は PE のリスクが高くなることを示唆している。推奨を裏付けるエビデンスは限られているが、遠位 DVT 患者の大部分は治療せずに経過観察を行っても、悪影響はなさそうである。**エビデンスレベル:** Limited**投票結果:** 賛成 82.94%、反対 14.69%、棄権 2.37% (強いコンセンサス)**CQ36: 整形外科手術を受ける無症候性患者に VTE のスクリーニングを実施する必要はあるか？**

著者: Daniel Caldeira, Aymard de Ladoucette, Taylor D'Amore 翻訳者: 山田和希

**推奨:** 無症候性患者において、主要な整形外科手術前後に超音波を用いた VTE のスクリーニングは推奨されない。**エビデンスレベル:** Moderate (術後スクリーニング)、Limited (術前スクリーニング)**投票結果:** 賛成 97.67%、反対 1.40%、棄権 0.93% (強いコンセンサス)**CQ37: 下肢 DVT を示唆する特異的な臨床所見はあるか？**

著者: Kazuki Yamada, Toshifumi Ozaki, Yutaka Inaba 翻訳者: 山田和希

**推奨:** 下肢 DVT の臨床診断は非特異的であり、それぞれの臨床所見の診断的価値は限定的である。**エビデンスレベル:** Moderate**投票結果:** 賛成 96.73%、反対 2.34%、棄権 0.93% (強いコンセンサス)**CQ38: DVT / PE の診断のための血清学的バイオマーカーはあるか？**

著者: Sofiene Kallel, Meriem Souissi, Lalit Maini, Yasim Khan, Lokesh Goyal, Nishant Bhatia 翻訳者: 山田和希

**推奨:** DVT / PE の検出に使用可能なマーカーがある。最も一般的に用いられる血清学的バイオマーカーは D ダイマーである。ただし、PAI-1、SF、FDP、TAT、PF 1+2 等のマーカーも利用可能である。**エビデンスレベル:** Grade-B. Fair evidence (Level II or III studies with consistent findings) for using serological markers.**投票結果:** 賛成 88.26%、反対 8.45%、棄権 3.29% (強いコンセンサス)

## CQ39: 整形外科手術を受ける患者の上肢および下肢 DVT を検出するために最適な画像診断法は何か?

著者: Graham S. Goh, John J. Corvi, Sabine Eichinger 翻訳者: 山田和希

**推奨:** 上肢および下肢 DVT の検出に最適な画像診断法は、静脈圧迫法による超音波検査 (CUS) である。中樞下肢、全下肢、連続など、どの部位に CUS を実施するかは、検査前臨床的確率の評価により決定すべきである。

**エビデンスレベル:** Strong

**投票結果:** 賛成 97.67%、反対 1.40%、棄権 0.93% (強いコンセンサス)

## CQ40: 下肢 DVT の診断において下肢静脈造影の意義はあるか?

著者: Tomasz Urbanek 翻訳者: 山田和希

**推奨 (1):** 下肢 DVT のルーチンの診断に静脈造影は推奨されない。画像検査を必要とする下腿 DVT が疑われる患者の初期診断には、静脈超音波検査 (VUS) が推奨される。

**推奨 (2):** 腸骨静脈または大静脈の血栓症が疑われる患者、および VUS の実施が困難あるいは結果が確定診断に至らない患者では、医療機関の設備状況と経験に基づき、CT 静脈造影法 (CTV) または MR 静脈造影法 (MRV) を行う必要がある。

**推奨 (3):** 下肢 DVT が強く疑われ、VUS の実施が困難あるいは結果が確定診断に至らない患者では、鼠径靱帯より遠位の静脈を CTV、MRV、または静脈造影により精査する必要がある。

**推奨 (4):** 下腿の無症候性 DVT の診断をエンドポイントに含める臨床試験では、規制機関の指示に応じて静脈造影が行われる場合がある。

**エビデンスレベル:** (1) Strong; (2) Moderate; (3) Moderate; (4) Moderate

**投票結果:** 賛成 99.07%、反対 0.47%、棄権 0.47% (強いコンセンサス)

## CQ41: 整形外科手術後の PE の診断に最適な画像検査は何か?

著者: Saad Tarabichi, Eric B. Smith 翻訳者: 横山裕介

**推奨:** 画像検査の進歩により肺塞栓の検出率は増加したが、中には臨床的意義がないものや、真の PE ではないものまで含まれてしまうことがある。よって、PE 診断のゴールドスタンダードは未だ CT 肺血管造影 (CTPA) である。

**エビデンスレベル:** Strong

**投票結果:** 賛成 99.07%、反対 0.00%、棄権 0.93% (強いコンセンサス)

## CQ42: 断層画像において肺動脈造影欠損があれば、それは全て PE と言えるか?

著者: Alisina Shahi, Mary K. Mulcahey, Emmanuele Thienpont 翻訳者: 横山裕介

**推奨:** 断層画像で見られる肺動脈造影欠損は、必ずしも PE を示すものではない。PE 以外にも、原発性肺動脈 (PA) 新生物、IgG4 関連疾患 (IgG4-RD) による肺血管障害、パーチェット病、高安血管炎 (TA)、Hughes-Stovin 症候群 (HSS) および肺動脈のストリークアーチファクトなどは、断層画像において動脈造影欠損を認める可能性がある。

**エビデンスレベル:** Strong

**投票結果:** 賛成 90.95%、反対 0.48%、棄権 8.57% (強いコンセンサス)

## CQ43: 肺の断層画像で同定された塞栓症は全て、同程度の酸素化障害 (低酸素症) を引き起こすか?

著者: Tyler J. Humphrey, Geno J. Merli, Stavros V. Konstantinides, Hany S. Bedair 翻訳者: 横山裕介

**推奨:** 肺の断層画像で検出された塞栓が全て同程度の低酸素症を引き起こすとは限らないことは既存の文献でも示唆されている。だが、塞栓の大きさや位置と、低酸素症の程度との関連性に関してはエビデンスが確立されていない。医療従事者は今後も、2019 欧州心臓病学会 (ESC) および 2020 米国血液学会 (ASH) で策定された VTE 管理ガイドラインに従って、血行動態および右室機能障害により急性 PE をきたした患者のリスク層別化を図っていくべきである。

**エビデンスレベル:** Limited

**投票結果:** 賛成 92.20%、反対 0.98%、棄権 6.83% (強いコンセンサス)

## CQ44: 高リスクな整形外科手術後の PE と二次性肺高血圧症との間に関連はあるか?

著者: Mohammad S. Abdelaal, Amar H. Kelkar, Anita Rajasekhar, Peter F. Sharkey 翻訳者: 横山裕介

**推奨:** 慢性血栓塞栓性肺高血圧症 (CTEPH) は、PE の既往と強く関連している。しかしながら、この関連性は高リスクな整形外科手術後においては十分に調査されていない。PE が整形外科手術後の合併症として認識されていること、PE 後の CTEPH の発生率が 0.1% から 9.1% であることを考えると、術後 PE に対する CTEPH の評価は、肺動脈血栓内膜摘除術 (PEA) などの早期治療につながり、後遺症や死亡を予防するためにも考慮されるべきである。

**エビデンスレベル:** Limited

**投票結果:** 賛成 88.78%、反対 2.93%、棄権 8.29% (強いコンセンサス)

**CQ45: VTE 予防薬の投与は致死性 PE のリスク低減に効果があるか?**

著者: Benjamin R. Emmerson, Karan Goswami, Mike Reed 翻訳者: 横山裕介

**推奨:** VTE 予防薬の投与により、下肢人工関節置換術を含めた待機的整形外科手術における致死性 PE のリスクが低減するというエビデンスはない。股関節骨折の患者では、アスピリンが致死性 PE を減少させるという限定的なエビデンスはあるが、エビデンスレベルが低く推奨には至らない。

エビデンスレベル: Limited

投票結果: 賛成 91.13%、反対 5.42%、棄権 3.45% (強いコンセンサス)

**CQ46: VTE 予防薬の有効性を判断するためには、どのエンドポイントを使用すべきか?**

著者: Jessica Morton, Irfan A. Khan, Diana Fernández-Rodríguez, Colin M. Baker, Javad Parvizi 翻訳者: 三澤治夫

**推奨:** VTE 予防薬の有効性を評価するには、症候性 DVT および PE の発生をエンドポイントとして使用すべきである。

エビデンスレベル: Moderate

投票結果: 賛成 94.63%、反対 4.39%、棄権 0.98% (強いコンセンサス)

**CQ47: 高リスクな整形外科手術後の適切な VTE 予防薬の投与期間はどれくらいか?**

著者: Crispiana Cozowicz, Jashvant Poeran, Stavros G. Memtsoudis 翻訳者: 三澤治夫

**推奨:** 高リスクな整形外科手術後、入院中に開始した VTE 予防薬の投与は、退院後 14 ~ 35 日間継続すべきである。

エビデンスレベル: Strong

投票結果: 賛成 94.86%、反対 4.21%、棄権 0.93% (強いコンセンサス)

**CQ48: 整形外科手術を受ける患者に使用される VTE 予防策の、それぞれの費用対効果はどうか?**

著者: Farzad Vosoughi, Mohammad S. Abdelal, S.M. Javad Mortazavi 翻訳者: 三澤治夫

**推奨:** アスピリンは安価であり、出血などの合併症の発生率も低く、血液検査などによるモニタリングも必要がないため、最も費用対効果の高い VTE 予防策である。さまざまな VTE 予防策の費用対効果は、薬物的 / 理学的療法にかかる初期コスト、血液モニタリングの必要性、合併症の発生率および中和剤の必要性に概ね左右される。それぞれの予防策にかかる費用は各国で大きく異なることも認識すべきである。

エビデンスレベル: Intermediate

投票結果: 賛成 92.52%、反対 4.21%、棄権 3.27% (強いコンセンサス)

**CQ49: それぞれの VTE 予防策において、患者のコンプライアンス / アドヒアランスに違いはあるか?**

著者: Adolfo Llinás, Guillermo Bonilla, Cristina Suarez, Daniel Monsalvo, Juan S. Sánchez-Osorio 翻訳者: 三澤治夫

**推奨:** それぞれの VTE 予防策に対する患者のアドヒアランスにはばらつきがあるが、そのばらつきのお大半は社会人口学的要因、社会経済的要因、病的要因、患者側要因、医療制度に特化した薬剤関連要因により説明される。良好なアドヒアランスのために、個々の患者の嗜好を理解することが、パーソンセンタードケアにおいても重要である。

エビデンスレベル: Limited

投票結果: 賛成 93.30%、反対 2.39%、棄権 4.31% (強いコンセンサス)

**CQ50: 整形外科手術の患者において、逐次併用 VTE 予防策は有効か?**

著者: James A. Larkin, Michael J. Dunbar, Emil Schemitsch 翻訳者: 三澤治夫

**推奨:** 現時点で逐次併用の VTE 予防策が、他の確立された予防策よりも優れていることを示すエビデンスはない。

エビデンスレベル: Limited

投票結果: 賛成 95.73%、反対 1.42%、棄権 2.84% (強いコンセンサス)

**CQ51: 各 VTE 予防薬の使用に特定の禁忌はあるか?**

著者: E. Bailey Terhune, Klaas Victor, Vasili Karas, Jan F.A. Somers 翻訳者: 藤原智洋

**推奨:** 各 VTE 予防薬にはそれぞれエビデンスに基づいた相対的および絶対的禁忌があり、患者の VTE リスクとのバランスを考慮して使用を検討すべきである。

エビデンスレベル: Strong

投票結果: 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

**CQ52: 慢性腎疾患 (CKD) 患者の整形外科手術に際し、VTE 予防策の変更は必要か？**

著者: S.M. Javad Mortazavi, Kirill Lobastov 翻訳者: 藤原智洋

**推奨:** 慢性腎疾患患者では、大出血やその他合併症を防ぐため、生化学的特性に基づき VTE 予防薬の用量調整が必要となる場合がある。安定していない進行性腎疾患では、VTE 予防として未分画ヘパリン (UFH) あるいは理学的予防のどちらかが望ましいと思われる。

エビデンスレベル: Limited

投票結果: 賛成 94.58%、反対 0.99%、棄権 4.43% (強いコンセンサス)

**CQ53: 慢性肝疾患 (CLD) 患者の整形外科手術に際し、VTE 予防策の変更は必要か？**

著者: Filippo Randelli, Emanuele Chisari, Viganò Martino, Claudio Cimminiello 翻訳者: 藤原智洋

**推奨:** CLD 単体では、VTE 予防策の留保あるいは変更の理由とはならない。VTE 予防策を変更するか否かは、VTE と出血の双方のリスクに基づき、集学的かつ個別に決定されるべきである。

エビデンスレベル: Consensus

投票結果: 賛成 95.12%、反対 0.49%、棄権 4.39% (強いコンセンサス)

**CQ54: 待機的整形外科手術を受ける患者において、VTE 予防のため血栓症の専門医や血液内科へのコンサルテーションが適応となるのはどのような患者か？**

著者: Daniel Caldeira, Geno Merli 翻訳者: 藤原智洋

**推奨:** 信頼できるエビデンスには欠けるが、われわれの総意としては、出血・凝固障害があるまたは疑われる患者、クレアチニククリアランスが 30mL/分未満の患者、活動性の肝胆道疾患、重度の貧血または血小板減少症のある患者、抗血小板剤や抗凝固剤の継続的な使用を必要とする患者は、血栓症の専門家や血液内科へのコンサルテーションが有益となりうる。

エビデンスレベル: Consensus

投票結果: 賛成 95.31%、反対 2.82%、棄権 1.88% (強いコンセンサス)

**CQ55: 患者が VTE 発症の高リスク群である場合、他の抗凝固薬よりも有効性が高い薬剤はあるか？**

著者: Dennis A. Sievers, William Jiranek, Ronald Navarro 翻訳者: 藤原智洋

**推奨:** 特定の抗凝固薬が他の薬剤より有効性が高いことを裏付ける報告は限られている。薬剤クラスと投与レジメンを検討したうえで、個々の患者の VTE リスクを高める特定の要因を考慮し、その要因に合わせた治療を行う必要がある。

エビデンスレベル: Limited

投票結果: 賛成 97.07%、反対 1.95%、棄権 0.98% (強いコンセンサス)

**CQ56: 急性心房細動 (AF) と診断された患者の整形外科手術において、周術期 VTE 予防策を変更すべきか？**

著者: Roya Sattarzadeh, Xavier Griffin 翻訳者: 小田孔明

**推奨:** AF と診断された患者の整形外科手術において、周術期 VTE 予防策の変更を示唆するエビデンスはない。ただし、米国心臓協会 (AHA)、米国心臓病学会 (ACC)、米国不整脈学会 (HRS)、欧州心臓病学会 (ESC) の最新の見解では、AF 患者のなかでも塞栓症リスクの高い患者においては、抗凝固薬の服用が推奨されている。

エビデンスレベル: Moderate

投票結果: 賛成 97.04%、反対 0.49%、棄権 2.46% (強いコンセンサス)

**CQ57: 国際標準化比 (INR) の高値のような凝固パラメーターが上昇している患者が整形外科の緊急手術を受ける際の、最適な管理法とは何か？**

著者: Marc Carrier, Alex C. Spyropoulos 翻訳者: 小田孔明

**推奨:** 整形外科の緊急手術を要する患者において、ビタミン K 拮抗薬 (VKA) の服用により INR が高い場合は、INR を 1.5 以下に修正することを推奨する。

エビデンスレベル: Limited

投票結果: 賛成 93.50%、反対 3.00%、棄権 3.50% (強いコンセンサス)

**CQ58: 血友病や Von Willebrand 病など、出血性疾患の患者に最適な VTE 予防策とは何か?**

著者: Mustafa Akkaya, Adolfo Llinás, Juan Sebastian Sanchez-Osorio, Mustafa Citak 翻訳者: 小田孔明

**推奨:** 整形外科手術を受ける出血性疾患の患者における最適な VTE 予防策は、理学的予防である。ただし、より高い血栓形成促進表現型を示す可能性のある特定の患者群、および血栓症のリスクを高める可能性のある凝固因子製剤（バイパス製剤）やモノクローナル抗体を使用している患者群では、軽度の薬物的 VTE 予防の追加を検討すべきである。

エビデンスレベル: Limited

投票結果: 賛成 96.50%、反対 0.00%、棄権 3.50% (強いコンセンサス)

**CQ59: 血栓性素因のような凝固障害をもつ患者における最適な VTE 予防策とは何か?**

著者: Adolfo Llinás, Mustafa Citak, Mustafa Akkaya, Juan S. Sánchez-Osorio 翻訳者: 小田孔明

**推奨:** 血栓性素因をもつ患者が高リスクな整形外科手術を受ける際には VTE 予防を行うべきである。VTE の発症頻度と重症度を推定するのは困難であり、その多様性に対処するため、術後最大 35 日間は理学的介入と薬物的介入の併用が推奨される。侵襲性の低い整形外科手術においては、下肢の手術に重点を置いたうえで、各術式の血栓形成リスクに応じた VTE 予防策を調整する必要がある。

エビデンスレベル: Limited

投票結果: 賛成 95.02%、反対 1.49%、棄権 3.48% (強いコンセンサス)

**CQ60: 整形外科手術を受ける患者における下大静脈 (IVC) フィルター使用の適応は何か?**

著者: Justin E. Kleiner, Paul Tornetta III 翻訳者: 小田孔明

**推奨:** IVC フィルターの使用は、VTE リスクが高く抗凝固薬療法が禁忌である患者に対して検討される場合がある。また、IVC フィルターは DVT 予防の目的でのルーチン使用は推奨されず、特に薬物的予防が可能な場合は使用を避けるべきである。

エビデンスレベル: Limited

投票結果: 賛成 94.23%、反対 3.85%、棄権 1.92% (強いコンセンサス)

**CQ61: 中和剤の利用が可能かどうかは VTE 予防薬の選択に影響を及ぼすか?**

著者: Ricardo Sousa, Humaid Al Farii, Muadh Alzeedi, Sultan Al Maskari 翻訳者: 熊谷研

**推奨:** 影響を及ぼす。一般的に使用される VTE 予防薬は十分な安全性情報と確立された中和剤のガイドラインを備えている。手術中に安全に継続できる薬剤もあれば（アスピリン、クロビドグレルなど）、中止することですぐに投薬前の状態に戻すことができる薬剤（低分子量ヘパリン [LMWH] など）もある。ビタミン K 拮抗薬（ワルファリンなど）や直接阻害型経口抗凝固薬（DOAC）などの他の薬剤は、術前より長い中止期間を要する。利用が限られているプロトロンビン複合体濃縮物などの拮抗剤や、イダルシズマブやエンデキシナルファなどの特定の中和剤は、緊急時に投与を要する場合がある。そのため、中和剤の利用可能性とコストは、VTE 予防薬の選択に影響を与える重要な要素である。

エビデンスレベル: Limited

投票結果: 賛成 89.15%、反対 4.25%、棄権 6.60% (強いコンセンサス)

**CQ62: 早期歩行など術後リハビリテーションのプロトコルは、整形外科手術後の VTE 発生率に影響を及ぼすか?**

著者: Clara A. Lobo, Kenneth A. Egol 翻訳者: 熊谷研

**推奨:** われわれの総意としては、早期歩行は整形外科手術後の VTE 発生率を低下させる。

エビデンスレベル: Moderate

投票結果: 賛成 99.07%、反対 0.93%、棄権 0.00% (強いコンセンサス)

**CQ63: 術前または術後に嚴重な床上安静をしている患者にとって最適な VTE 予防策は何か?**

著者: Abtin Alvand, Raja Bhaskara Rajasekaran, Adolph J. Yates Jr. 翻訳者: 熊谷研

**推奨:** 嚴重な床上安静の患者における最適な血栓予防策は不明である。薬物的および／または理学的（間欠的圧迫装置 [ICD] など）予防の任意の組み合わせは、長期に嚴重な床上安静になる患者で考慮される場合がある。

エビデンスレベル: Limited

投票結果: 賛成 96.60%、反対 1.94%、棄権 1.46% (強いコンセンサス)

## CQ64: 整形外科手術を受ける患者の VTE 予防として間欠的圧迫装置 (ICD) を使用する役割はあるか?

著者: Colin M. Baker, Clifford Colwell 翻訳者: 熊谷研

**推奨:** 役割はある。ICD は、整形外科手術後の VTE 発症を防止する。これらのデバイスの利用は、効果的な予防手段であることが示されている。

**エビデンスレベル:** Moderate

**投票結果:** 賛成 95.81%、反対 3.26%、棄権 0.93% (強いコンセンサス)

## CQ65: VTE 予防にフットポンプの使用は、下肢の間欠的圧迫装置 (ICD) と同じくらい有効か?

著者: Tara G. Moncman, Alexander C. Top, Brian S. Winters, Charles Deltour, Jan F. Noyez 翻訳者: 熊谷研

**推奨:** フットポンプは薬物的予防と組み合わせて使用すると、下肢の ICD と同じくらい有効である。

**エビデンスレベル:** Moderate

**投票結果:** 賛成 95.07%、反対 1.97%、棄権 2.96% (強いコンセンサス)

## CQ66: 整形外科手術を受ける患者への VTE 予防として圧迫ストッキングは効果があるか?

著者: Alejandro Gonzalez Della Valle, Christian B. Ong, Eduardo A. Salvati, Paul F. Lachiewicz 翻訳者: 竹山昌伸

**推奨:** 弾性圧迫ストッキングは、VTE に対してある程度の予防効果を有する可能性がある。

**エビデンスレベル:** Moderate

**投票結果:** 賛成 87.79%、反対 8.92%、棄権 3.29% (強いコンセンサス)

## CQ67: 間欠的空気圧迫装置 (IPCD) の種類により効果に違いはあるか?

著者: Kang-Il Kim, Jun-Ho Kim, Paul F. Lachiewicz 翻訳者: 竹山昌伸

**推奨:** 現在のエビデンスでは、さまざまなタイプの IPCD 間で臨床結果に顕著な差は示されていない。しかし、患者モニタリングセンサー併用の連続圧迫装置は、患者のコンプライアンスを向上させる可能性がある。

**エビデンスレベル:** Moderate

**投票結果:** 賛成 94.76%、反対 1.90%、棄権 3.33% (強いコンセンサス)

## CQ68: 急性遠位型 DVT が確認された場合、患者への機械的圧迫装置 (MCD) は中止すべきか?

著者: Pedro Tort-Saade, Antonio Otero-López, Louis M. Kwong, David Beatón-Comulada, Norberto J. Torres-Lugo, Roberto G. Colón-Miranda, Ruben Tresgallo-Parés 翻訳者: 竹山昌伸

**推奨:** 急性遠位型 DVT 患者に対して、現行のガイドラインで推奨されている DVT 治療プロトコル (抗凝固療法) と併用して MCD の継続を検討できる。

**エビデンスレベル:** Limited

**投票結果:** 賛成 85.00%、反対 9.00%、棄権 6.00% (強いコンセンサス)

## CQ69: 待機的整形外科手術において術前内服している抗血小板薬の最適な取り扱い?

著者: Gregg R. Klein, William V. Arnold, Minal Cordeiro, Mathew Mead, Ajay Srivastava 翻訳者: 竹山昌伸

**推奨:** 待機的整形外科手術の前に抗血小板薬の継続または中止を推奨する十分なエビデンスはない。本件に関する研究は質が低く、ほとんどの研究はアスピリンのみに関するもので、クロピドグレル、チカグレロル、プラスグレレルなど他の抗血小板薬について研究がなされておらず、より質の高い研究が必要である。

**エビデンスレベル:** Low

**投票結果:** 賛成 92.02%、反対 5.16%、棄権 2.82% (強いコンセンサス)

## CQ70: 緊急整形外科手術において術前内服している抗血小板薬の最適な取り扱い?

著者: Gregg R. Klein, William V. Arnold, Ajay Srivastava 翻訳者: 竹山昌伸

**推奨:** 抗血小板薬を服用している患者において、緊急整形外科手術の延期を支持するエビデンスはない。この疑問に関する無作為化比較試験 (RCT) は今日まで実施されておらず、また、ほとんどの研究は大腿骨近位部骨折の手術に焦点を当てたものである。また、研究は主にアスピリンおよび/あるいはクロピドグレルに集中しており、チカグレロル、プラスグレレルなど他の抗血小板薬についての研究はごくわずかである。より明確な推奨を出すには、さらなる質の高い研究が必要である。

**エビデンスレベル:** Low

**投票結果:** 賛成 94.84%、反対 2.82%、棄権 2.35% (強いコンセンサス)

**CQ71: 整形外科手術を受ける患者において、手術前にアスピリン投与を中止すべきか？**

著者: Marcelo M. Lizarraga, Suhail Suresh, Takahiro Niikura, Luis F. Elias, Marzaid E. Manzaneda, Juan C. Castro Bejarano, Miguel S. Egoavil, Sara L. Whitehouse, Ross W. Crawford 翻訳者: 新倉隆宏

**推奨:** 心血管系診療に対して投与されているアスピリンは、整形外科手術の施行時にルーチンに休薬すべきではない。アスピリン投与の継続は心血管系保護に作用することが多く、出血量増加に繋がらないことが多い。

**エビデンスレベル:** Limited

**投票結果:** 賛成 97.67%、反対 2.33%、棄権 0.00% (強いコンセンサス)

**CQ72: 待機的整形外科手術を行う患者が抗凝固療法を受けている場合、いつこれを中止すべきか？**

著者: Eric S. Schwenk, Thomas Volk, Alessandro Squizzato 翻訳者: 新倉隆宏

**推奨:** 待機的整形外科手術の実施前に、アセノクマロールは3日間、ワルファリンとフルインジオンは5日間、フェンプロクモンは7日間休薬すべきである。直接阻害型経口抗凝固薬 (DOAC) (アピキサパン、エドキサパン、ダビガトラン、リバロキサパン) は待機的整形外科手術の実施前に最低2日間は休薬すべきである。また、ダビガトラン投与患者では、クレアチニンクリアランスが80 mL/min 未満の場合さらに1日、30 mL/min より高く50 mL/min 未満の患者ではさらに2~3日間延長して休薬すると良い。

**エビデンスレベル:** Limited

**投票結果:** 賛成 94.86%、反対 2.80%、棄権 2.34% (強いコンセンサス)

**CQ73: 待機的整形外科手術を受ける前に慢性的な抗凝固療法を受けている患者に対して、注射用抗凝固療法による置換を検討すべきか？**

著者: Arjun Saxena, P. Maxwell Courtney 翻訳者: 大江啓介、新倉隆宏

**推奨:** VTE 予防または非弁膜症性心房細動で慢性的に経口抗凝固療法を受けている患者は、整形外科手術前に低分子量ヘパリン (LMWH) または未分画ヘパリン静脈内投与への置換を行うべきではない。複数の質の高い研究が、ヘパリン置換を受けた患者における血栓塞栓性イベントに差はないものの、周術期の出血性合併症のリスクが高くなることを示している。人工心臓弁のために経口抗凝固療法を受けている患者については、血栓塞栓イベントのリスクと出血のリスクを天秤にかけてヘパリン置換を検討する必要がある。しかし、機械式心臓弁の患者305人を対象とした最近の無作為化比較臨床試験では、ヘパリン置換の有用性は証明されていない。

**エビデンスレベル:** Strong

**投票結果:** 賛成 94.88%、反対 1.40%、棄権 3.72% (強いコンセンサス)

**CQ74: アスピリンの低用量と通常用量では、整形外科手術後の VTE 予防効果に違いはあるか？**

著者: Corinne Mirkazemi, Jesus M. Villa, Tejbir S. Pannu, Carlos A. Higuera 翻訳者: 福井友章、新倉隆宏

**推奨:** アスピリンの低用量と通常用量では、整形外科手術後の VTE 予防効果に差は無さそうである。しかし、忍容性や消化器系の副作用の面では低用量アスピリンの方が好ましい。

**エビデンスレベル:** Limited

**投票結果:** 賛成 93.87%、反対 3.30%、棄権 2.83% (強いコンセンサス)

**CQ75: アスピリンにアレルギーのある患者に対しては、どのような VTE 予防薬を投与すべきか？**

著者: Graham S. Goh, Terence L. Thomas, Henry Fu 翻訳者: 澤内健一、新倉隆宏

**推奨:** VTE 予防目的でのアスピリン投与の利点を安全性と費用対効果の面から考慮すると、全身性アレルギー反応を指摘されていない限り、真のアスピリン過敏症なのか否か詳細な検査を検討すべきである。検査によりアスピリン増悪性呼吸器疾患 (AERD) または粘膜皮膚反応と判断された患者は、脱感作プロトコルの適応となる。患者がアスピリンに対して全身性アレルギー反応を示すまれなケースでは、脱感作は避け、代替の VTE 予防薬を使用すべきである。

**エビデンスレベル:** Limited

**投票結果:** 賛成 90.82%、反対 5.31%、棄権 3.86% (強いコンセンサス)

**CQ76: 整形外科手術を受ける患者の VTE 予防薬として非ステロイド性抗炎症薬 (NSAIDs) は使用できるか？**

著者: Dana Alameddine, Alessandro Squizzato, Nicoletta Riva, Cassius I. Ochoa Chaar 翻訳者: 長谷川正裕

**推奨:** 整形外科手術を受ける患者の VTE 予防において、NSAIDs の単独薬剤としての使用はエビデンスが不十分である。

**エビデンスレベル:** Limited

**投票結果:** 賛成 97.66%、反対 0.93%、棄権 1.40% (強いコンセンサス)

## CQ77: 整形外科手術を受ける患者に対して、非ステロイド性抗炎症薬 (NSAIDs) は VTE 予防薬として用いるアスピリンと同時投与できるか?

著者: Mehmet A. Cacan, Ibrahim Azboy 翻訳者: 長谷川正裕

**推奨:** NSAIDs のアスピリンとの同時摂取は、アスピリンの抗血小板作用を減少させる可能性がある。この作用は非選択的 NSAIDs ではさらに大きくなる。そのため、アスピリンは NSAIDs 服用の少なくとも 2 時間前に服用すべきである。

**エビデンスレベル:** Moderate

**投票結果:** 賛成 89.52%、反対 3.81%、棄権 6.67% (強いコンセンサス)

## CQ78: VTE の予防において様々な第 Xa 因子阻害薬の有効性と安全性に違いはあるか?

著者: Charles Marc Samama, Jared Warren 翻訳者: 長谷川正裕

**推奨:** VTE 予防において、特定の第 Xa 因子阻害薬が他の薬剤より優れているかを示すデータは不十分である。

**エビデンスレベル:** Limited

**投票結果:** 賛成 92.52%、反対 4.21%、棄権 3.27% (強いコンセンサス)

## CQ79: VTE 予防で使われる第 Xa 因子阻害薬において、その活性／有効性のモニターとして使える血液検査はあるか?

著者: Stanislav Bondarenko, Masahiro Hasegawa, Valentyna Maltseva, Olexandr Vysotskyi, Yale A. Fillingham

翻訳者: 長谷川正裕

**推奨:** 活性化部分トロンボプラスチン時間 (aPTT) とプロトロンビン時間 (PT) はそれぞれ、未分画ヘパリン、ビタミン K 拮抗薬の活性をモニターすることができる。しかし、aPTT も国際標準化比 (INR) も第 Xa 因子阻害薬のモニターとしては信頼できない。発色性抗 Xa 活性は血清および血漿の第 Xa 因子阻害薬の活性評価として信頼できる。しかし、抗 Xa 活性は VTE の予防または治療に利用できない。

**エビデンスレベル:** Limited

**投票結果:** 賛成 93.84%、反対 1.42%、棄権 4.74% (強いコンセンサス)

## CQ80: ワルファリンは初回投与時に過凝固状態を引き起こすか?

著者: Denis Nam, Robert L. Barrack 翻訳者: 長谷川正裕

**推奨:** 過去の報告でワルファリンの投与は一時的な過凝固状態を引き起こすことが示唆されている。

**エビデンスレベル:** Moderate

**投票結果:** 賛成 90.95%、反対 1.43%、棄権 7.62% (強いコンセンサス)

## CQ81: VTE 予防のためにワルファリンが使用される場合、整形外科手術後に他の治療用抗凝固剤で置換する意義はあるか?

著者: Jourdan M. Cancienne, Brian C. Werner 翻訳者: 伊藤陽平

**推奨:** ワルファリン投与患者が待機整形外科手術を受ける際、未分画ヘパリン (UFH) または低分子量ヘパリン (LMWH) との置換をルーチンに行うべきではない。機械式心臓弁などの併存疾患があり、血栓塞栓症のリスクが出血のリスクよりも高い患者では、置換も検討される。

**エビデンスレベル:** Limited

**投票結果:** 賛成 91.94%、反対 3.32%、棄権 4.74% (強いコンセンサス)

## CQ82: VTE 予防に使用される様々な注射用薬剤の有効性と安全性に違いはあるか?

著者: Sahar Hamdi, Rudolf W. Poolman, Cassius I. Ochoa Chaar 翻訳者: 伊藤陽平

**推奨:** 低分子量ヘパリン (LMWH) および未分画ヘパリン (UFH) と比較して、フォンダパリヌクスは整形外科手術後の VTE 予防に優れた有効性を有すると思われる。現在のエビデンスに基づく、周術期の出血リスクという点では、それぞれの注射用薬剤の安全性に差はないように思われる。

**エビデンスレベル:** Moderate

**投票結果:** 賛成 91.12%、反対 6.07%、棄権 2.80% (強いコンセンサス)

**CQ83: 整形外科手術を受ける患者の VTE 予防として、低分子量ヘパリン (LMWH) を開始する最適なタイミングはいつか？**

著者: Dragan K. Radoičić, Harmen B. Ettema 翻訳者: 伊藤陽平

**推奨:** 整形外科手術を受ける患者の VTE 予防として、LMWH の投与を開始する最適なタイミングは、術後 12 ～ 24 時間である。質の高いエビデンスは不足しているが、いくつかの研究では、LMWH を術前または術直後に投与すると、術後の出血リスクが高まる事が確認されている。また、脊髄幹麻酔 (脊髄くも膜下麻酔や硬膜外麻酔) を受ける患者においても、LMWH 投与の早期開始には懸念がある。LMWH を術前に開始するのは、術後 (12 時間以上) に開始するのとは比べ、利点はないように思われる。特定の手術、特に外傷患者や VTE リスクのある患者に対する実際の開始時期については、選択した LMWH の薬物動態、外科医/麻酔科医の優先項目、および患者の併存疾患に従って決定する必要がある。

エビデンスレベル: Limited

投票結果: 賛成 97.67%、反対 0.93%、棄権 1.40% (強いコンセンサス)

**CQ84: VTE 予防のための低分子量ヘパリン (LMWH) の投与量は、体重で調整されるべきか？**

著者: Louis M. Kwong, Hasan Huseyin Ceylan 翻訳者: 伊藤陽平

**推奨:** 限られたデータではあるが、LMWH の体重による投与量の調節は、患者が極めて低体重あるいは肥満である場合、VTE 予防に有益である可能性が示唆されている。

エビデンスレベル: Limited

投票結果: 賛成 95.33%、反対 2.80%、棄権 1.87% (強いコンセンサス)

**CQ85: 整形外科手術を受ける患者に VTE 予防薬を投与すると、術後の VTE 以外の合併症の発生率は高まるか？**

著者: Jean-Yves Jenny 翻訳者: 伊藤陽平

**推奨:** THA および TKA を受ける患者に VTE 予防薬を投与すると、術後の出血性合併症の発生率が高くなる。アスピリンは最もリスクが低い。他の整形外科手術については、文献上では結論が出ていない。

エビデンスレベル: Strong

投票結果: 賛成 95.77%、反対 1.88%、棄権 2.35% (強いコンセンサス)

**CQ86: 整形外科手術を受ける患者において、VTE 予防薬の投与は頭蓋内出血のリスクを高めるか？その場合、予防薬の種類によりリスクは異なるか？**

著者: Walter Ageno, Daniel Caldeira 翻訳者: 川端佑介

**推奨:** 抗血栓薬による治療を長期に渡って受けている患者においては、抗血栓薬の使用と頭蓋内出血のリスクの関連が報告されている。整形外科の手術を受けた患者において、頭蓋内出血をきたした報告は少ない。これは抗血栓薬の使用期間が短いためと考えられる。頭蓋内出血の発生率は、ビタミン K 拮抗薬 (VKA) の使用でより高くなるようである。

エビデンスレベル: Limited

投票結果: 賛成 90.29%、反対 1.46%、棄権 8.25% (強いコンセンサス)

**CQ87: 整形外科手術を受ける患者において、VTE 予防薬の投与は硬膜外血腫 (EH) のリスクを高めるか？またその予防薬の種類によりリスクは異なるか？**

著者: Jason Kopenitz, Eric S. Schwenk, Eugene R. Viscusi 翻訳者: 川端佑介

**推奨:** EH は、稀ではあるが、脊髄幹麻酔 (脊髄くも膜下麻酔や硬膜外麻酔) の重大な合併症である。TJA 患者への VTE 予防薬の使用は EH と関連があり、中でも低分子量ヘパリン (LMWH) は現在使用されている薬剤のうち最もリスクが高いとされる。また、直接阻害型経口抗凝固薬 (DOAC) の使用も EH と関連がある。

エビデンスレベル: Moderate

投票結果: 賛成 96.17%、反対 1.91%、棄権 1.91% (強いコンセンサス)

**CQ88: 整形外科手術を受ける患者において、術後に起こる創部障害のリスクは VTE 予防薬の種類によって異なるか？**

著者: Majd Tarabichi, Diana Fernández-Rodríguez 翻訳者: 川端佑介

**推奨:** VTE 予防薬の種類によって異なる。アスピリンは他の予防薬と比較して、術後創部障害のリスクが低いように思われる。

エビデンスレベル: Limited

投票結果: 賛成 94.37%、反対 2.82%、棄権 2.82% (強いコンセンサス)

## CQ89: 整形外科手術を受けた患者において、創部に関連する障害が発生した場合、VTE 予防薬を変更すべきか？

著者: Carlos Bracho, Marjan Wouthuyzen-Bakker, German Salazar, Estuardo Barragán, Mathias Salazar, Edwin Larco

翻訳者: 川端佑介

**推奨:** VTE 予防薬を変更すべきである。創部からの持続的な排液、出血、血腫形成などの障害がある場合、抗凝固薬の中断、あるいはより作用が弱い抗凝固薬への変更が推奨される。

**エビデンスレベル:** Low

**投票結果:** 賛成 96.23%、反対 1.89%、棄権 1.89% (強いコンセンサス)

## CQ90: VTE 予防薬の投与による血腫は、関節線維症のリスクを高めるか？

著者: Julian F. Maempel, Eustathios Kenanidis, Nikolaos Milonakis, Eleftherios Tsiridis 翻訳者: 川端佑介

**推奨:** VTE 予防薬の使用と関節線維症を関連付ける堅固なデータはない。ある 1 件の後ろ向き研究によると、前十字靭帯再建術 (ACLR) 後にアスピリン以外の薬剤による VTE 予防を行った患者では、血栓予防を行わなかった患者と比較して、麻酔下でのマニピュレーションまたは癒着剥離を要するリスクが高まったと報告されている。

**エビデンスレベル:** Limited

**投票結果:** 賛成 88.78%、反対 4.88%、棄権 6.34% (強いコンセンサス)

## CQ91: 術後に VTE が疑われるが確定していない患者に対して、経験的治療を行うのは有用か？

著者: Deepak Menon, Oussama Abcha, Sofiene Kallel, Hemant Pandit 翻訳者: 河邊有一郎

**推奨:** 術後に VTE が疑われる場合、抗凝固療法による経験的全身治療を開始するのは、画像に基づく適時診断ができない場合に限るべきである。早期の治療により、VTE に伴う罹患リスクを低減することができる。しかし、直近の手術による出血リスクの増加も考慮する必要がある。抗凝固療法の開始は最終的には臨床的な判断であり、個々の患者の要因に基づいて包括的なリスクベネフィット評価を行うべきである。

**エビデンスレベル:** Low

**投票結果:** 賛成 94.58%、反対 0.99%、棄権 4.43% (強いコンセンサス)

## CQ92: 術後 VTE が確認された患者のモニタリングに最も適した方法は何か？

著者: Agustin García-Mansilla, Fernando Holc, Martin Buttaró 翻訳者: 河邊有一郎

**推奨:** 整形外科手術後に VTE をモニタリングすべきかどうかは明確ではないが、持続的な危険因子のために VTE を発症している特定の患者では、血清 D ダイマー測定の有無にかかわらず経時的超音波検査が好ましい。

**エビデンスレベル:** Limited

**投票結果:** 賛成 91.67%、反対 6.37%、棄権 1.96% (強いコンセンサス)

## CQ93: PE が確認された患者の術後リハビリテーションは変更すべきか？

著者: Noel Chan, Dina Brooks, David Beverland 翻訳者: 河邊有一郎

**推奨:** 整形外科手術後、PE の診断がなされ、治療として抗凝固療法が行われている場合、術後のリハビリテーションは遅滞なく行うべきである。高/中リスクの PE 患者では、リハビリテーションは手術部位の機能回復に取り組むだけでなく、呼吸訓練や嚴重にモニターされた有酸素運動を取り入れ、肺機能と患者の QOL を徐々に向上させる必要がある。この推奨は、早期の運動やリハビリテーションプログラムが有害事象 (すなわち PE や出血の再発) のリスクを高めるというエビデンスがないこと、また、リハビリテーションの利点が明確に確立されていることから行われるものである。ただし、PE 患者の中には、心肺機能が低下していたり、他の医学的合併症があったりする場合があることを忘れてはならない。そのような患者には、症状に応じて運動療法の変更が必要となる場合もある。

**エビデンスレベル:** Limited

**投票結果:** 賛成 97.55%、反対 0.49%、棄権 1.96% (強いコンセンサス)

## CQ94: 症候性 VTE が確認された患者の術後リハビリテーションは変更すべきか？

著者: Yong-Han Cha, Yavuz Saglam, Jun-Il Yoo, Kyung-Hoi Koo 翻訳者: 河邊有一郎

**推奨:** 症候性 VTE 患者に対する術後リハビリテーションプロトコルの修正または変更を支持するエビデンスはない。

**エビデンスレベル:** Strong

**投票結果:** 賛成 95.61%、反対 1.95%、棄権 2.44% (強いコンセンサス)

**CQ95: 術後 VTE 患者の管理における血栓溶解療法は有用か?**

著者: Azlina A. Abbas, Chee Ken Chan, Cihan Ay, Mikel Sadek 翻訳者: 河邊有一郎

**推奨:** 術後の VTE 患者における血栓溶解療法の有用性を確立する文献的エビデンスはないものの、一部の患者には血栓溶解療法が有用である可能性がある。以下のような状況下の術後患者群において、医原性出血および血腫リスクに注意しながら、血栓溶解療法を検討する必要がある。

1. 急性虚血肢を伴う DVT 患者群 (例: 有痛性青股腫)
2. 出血リスクは低いが腸骨大腿静脈を含む症候性 DVT を有する患者、および重度の血栓後症候群 (PTS) のリスクが高い患者群

エビデンスレベル: Consensus

投票結果: 賛成 91.50%、反対 3.00%、棄権 5.50% (強いコンセンサス)

**CQ96: 重症急性呼吸器症候群関連コロナウイルス (SARS-CoV [COVID-19]) の既往歴がある患者が整形外科手術を受ける場合、VTE リスクは通常より高いか? その場合、術後の抗凝固療法を変更する必要はあるか?**

著者: George Komnos, Theofilos Karachalios, Eugénia Cruz, Farideh Najafi, Neusha Hollingsworth, Javad Parvizi

翻訳者: 手塚太郎

**推奨:** SARS-CoV (COVID-19) 感染により、血栓塞栓症のリスクが高くなることは一般に知られている。しかし、COVID-19 の既往歴が整形外科手術後の VTE リスクを高めるかと言えば、それを示唆する十分なデータはない。したがって、COVID-19 の既往がある患者の VTE 予防策を変更する必要はない。

エビデンスレベル: Limited

投票結果: 賛成 94.66%、反対 1.94%、棄権 3.40% (強いコンセンサス)

**CQ97: 重症急性呼吸器症候群関連コロナウイルス (SARS-CoV [COVID-19]) ワクチン接種は VTE のリスクを増加させるか?**

著者: Farideh Najafi, Mohammad S. Abdelaal, Javad Parvizi 翻訳者: 手塚太郎

**推奨:** SARS-CoV (COVID-19) のワクチン接種者の VTE リスクは、一般集団と同様である。しかし頻度は低いが、アデノウイルス・ベクターを利用したワクチンの副作用として、脳や腹部などのまれな部位に血小板減少を伴う VTE を発症することがある。この発症メカニズムはまだ不明であり、ヘパリン起因性血小板減少症 (HIT) と似た傾向を認めたため、治療には、非ヘパリン抗凝固剤と免疫グロブリンの静脈内投与を含めるべきである。

エビデンスレベル: Limited

投票結果: 賛成 91.58%、反対 0.99%、棄権 7.43% (強いコンセンサス)

**CQ98: この臨床実践ガイドライン (CPG) は、VTE 予防の標準治療となるか?**

著者: Heather Hansen 翻訳者: 手塚太郎

**推奨:** この CPG は、デルファイ法を用いた策定によりバイアスの可能性が排除されており、また、全整形外科専門分野を網羅した初のガイドラインでもあるため、整形外科領域における VTE 予防の標準治療となりうるものである。

エビデンスレベル: Moderate

投票結果: 賛成 93.27%、反対 2.40%、棄権 4.33% (強いコンセンサス)

## QUESTION 1: Are certain patients identified to be at greater risk for venous thromboembolism than others?

**RECOMMENDATION:** Certain patient populations have been identified to be at greater risk for venous thromboembolism (VTE).

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## QUESTION 2: Are there genetic predisposing factors for VTE?

**RECOMMENDATION:** There are 5 classic thrombophilias that have a genetic predisposition for venous thromboembolism (VTE). A large proportion of the inherited risk factors for VTE remain undiscovered and many new loci associated with VTE risk continue to be identified.

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## QUESTION 3: Is there a correlation between age and the risk of VTE in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** Increasing age is associated with an increased risk of postoperative venous thromboembolism (VTE) in patients undergoing orthopaedic procedures.

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## QUESTION 4: Is the risk of VTE following orthopaedic procedures related to ethnicity or race? If yes, should VTE prophylaxis be altered or changed based on race and/or ethnicity?

**RECOMMENDATION:** At this time, evidence is insufficient to suggest that venous thromboembolism (VTE) prophylaxis should be altered based on race/ethnicity.

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## QUESTION 5: Is there a definite association between BMI and VTE?

**RECOMMENDATION:** Extensive evidence confirms a definite association between unprovoked venous thromboembolism (VTE) and increasing body mass index (BMI). However, the evidence linking BMI to postoperative VTE is more equivocal.

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## QUESTION 6: Does a history of prior VTE influence the rate of subsequent VTE in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** Patients with a previous history of venous thromboembolism (VTE), including both deep venous thrombosis (DVT) and pulmonary embolism (PE), are at a higher risk of developing VTE following orthopaedic procedures.

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## QUESTION 7: Does the type (DVT vs. PE) or timing (remote vs. recent) of prior VTE influence the risk of subsequent VTE following orthopaedic procedures?

**RECOMMENDATION:** While it seems a reasonable assumption that patients with a history of venous thromboembolism (VTE) are at higher risk of post-operative VTE, there is little high-quality literature available regarding the effect of type or timing of prior VTE on subsequent VTE risk.

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## QUESTION 8: Do patients with an underlying diagnosis of infection (local or systemic) undergoing orthopaedic procedures have an elevated risk for subsequent VTE?

**RECOMMENDATION:** Patients with a systemic infection undergoing orthopaedic procedures have a higher risk of postoperative venous thromboembolism (VTE). This relationship for local infection is not proven.

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## QUESTION 9: Does the presence of varicosities and/or superficial lower extremity thrombosis increase the risk of VTE in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** The presence of varicose veins increases the risk of postoperative venous thromboembolism (VTE) by approximately 3 times in patients undergoing major orthopaedic procedures (Strong). A history of superficial venous thrombosis (SVT) increases the risk of postoperative VTE by 5 - 10 times in patients undergoing lower limb orthopaedic surgery (Limited). Acute SVT further increases the risk of VTE, and elective orthopaedic procedures should be postponed for at least 3 months if possible (Limited).

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## QUESTION 10: (A) Do oral contraceptive medications increase the risk of VTE? (B) If so, should they be stopped prior to orthopaedic procedures?

**RECOMMENDATION:** The incidence of postoperative venous thromboembolism (VTE) is increased in women who use oral contraceptives pills (OCP), as compared to women who do not. Cessation in all users is not recommended. However, OCP use should be taken into account when assessing the patient's and the procedure's estimated risk and hence, form a basis for decisions on thromboprophylaxis.

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## QUESTION 11: Do oral hormonal therapy, used for cancer management, increase the risk of post-operative VTE in patients undergoing orthopaedic procedures? If so, should they be stopped prior to surgery?

**RECOMMENDATION:** Hormonal therapy used in cancer management, like tamoxifen, increases the risk of venous thromboembolism (VTE) in patients undergoing orthopaedic procedures. We suggest they should be suspended at least 7 days before surgery, a degree of individualization of approach is needed based on risk factors and clinical settling (type of cancer, etc.).

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## QUESTION 12: Are patients, who traveled on airplanes or had long car rides prior to surgery, at an increased risk of VTE? If so, what is the optimal interval between travel and surgery?

**RECOMMENDATION:** It is well established that travel on airplanes, especially 'long-haul flights', is a major risk factor for development of venous thromboembolism (VTE). Individuals with preexisting risk factors for VTE appear to be at greatest risk. There is a paucity of literature examining the influence of long-distance travel prior to surgery on the risk of postoperative VTE. Similarly, while it is commonly accepted that airplane travel in the acute postoperative period should be avoided due to an increased risk of VTE, there is limited evidence supporting this notion. Lastly, due to limited literature on the optimal strategy for VTE risk mitigation in patients who engage in long-distance travel either pre- or post-operatively, the choice of prophylactic agent should be individualized, taking into account the relative risks and benefits of different pharmacological and non-pharmacological options for each patient.

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## QUESTION 13: Do all orthopaedic procedures have the same risk profile for DVT?

**RECOMMENDATION:** Orthopaedic procedures carry variable risk profiles for deep venous thrombosis (DVT). They have been classically stratified according to the incidence of venous thromboembolism (VTE) events, with total hip arthroplasty (THA) and total knee arthroplasty (TKA) being the highest risk alongside with hip fracture fixation.

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## QUESTION 14: Does the duration of surgery influence the incidence of postoperative VTE?

**RECOMMENDATION:** Surgical duration is directly associated with an increased risk of venous thrombosis (VTE). When intraoperative complications or surgical complexity affect the length of surgery, VTE risk should be reevaluated.

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## QUESTION 15: Does the volume of intraoperative blood loss influence the incidence of post-operative VTE in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** There is no concrete data related to this issue. However, because of a potential association between allogeneic blood transfusion and postoperative venous thromboembolism (VTE), we recommend that strategies be in place to reduce intraoperative blood loss and the possible need for allogeneic blood transfusion.

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## QUESTION 16: Does administration of allogeneic blood transfusion influence the incidence of post-operative VTE in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** The majority of the clinical studies, largely from total joint arthroplasty (TJA) literature, cite an association between allogeneic blood transfusions and venous thromboembolism (VTE) following orthopaedic surgery. Along with the scientific rationale, these associations are sufficient to urge surgeons to minimize the use of allogeneic blood transfusions in the peri-operative period.

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## QUESTION 17: Does administration of tranexamic acid (TXA) to patients undergoing orthopaedic procedures increase the risk of subsequent VTE?

**RECOMMENDATION (A):** Administration of tranexamic acid (TXA) in patients undergoing orthopaedic procedures does not increase the risk of developing subsequent venous thromboembolism (VTE) in patients without prior VTE history.

**RECOMMENDATION (B):** Administration of TXA in patients undergoing orthopaedic procedures does not increase the risk of developing subsequent VTE in patients with prior VTE or equivalently elevated hypercoagulability risk.

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## QUESTION 18: Does tourniquet applied to the lower extremity influence the incidence of post-operative VTE?

**RECOMMENDATION:** There is inadequate evidence to link the use of lower extremity tourniquet during orthopaedic procedures and postoperative venous thromboembolism (VTE).

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## QUESTION 19: Does tourniquet applied to upper extremity influence the incidence of post-operative VTE?

**RECOMMENDATION:** There does not appear to be a high rate of venous thromboembolism (VTE) after the use of tourniquets for upper extremity surgery.

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## QUESTION 20: Is intraoperative heparin effective and safe to prevent postoperative VTE in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** Intravenous (IV) administration of intraoperative heparin to patients undergoing total hip arthroplasty (THA) has been investigated and found to be safe and effective in prevention of postoperative venous thromboembolism (VTE). Further studies are needed to evaluate the efficacy of this modality in other orthopaedic procedures.

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## QUESTION 21: Does the type of anesthesia administered influence the risk of VTE in orthopaedic surgery?

**RECOMMENDATION:** The use of neuraxial anesthesia is associated with a reduced risk of venous thromboembolism (VTE) after lower extremity joint arthroplasty and should be considered as part of a multimodal prophylaxis regimen when feasible.

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## QUESTION 22: Does the use of PMMA cement during orthopaedic procedures influence the risk of subsequent VTE?

**RECOMMENDATION:** Although polymethyl methacrylate (PMMA) cement and its component parts have not been demonstrated to be thrombogenic in vitro, the use of PMMA cement does influence the risk of subsequent embolization, some of which may be labeled as venous thromboembolism (VTE).

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## QUESTION 23: Does the intra-operative positioning of a patient undergoing orthopaedic surgery influence the risk of subsequent VTE?

**RECOMMENDATION:** While surgical positioning may influence the venous thromboembolism (VTE) risk after some orthopaedic surgical procedures, there are no high-quality studies addressing this issue. We recommend that surgeons base these decisions on optimal surgical site access/exposure as well as their technical expertise rather than as a strategy to reduce VTE risk.

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## QUESTION 24: Is there a validated risk stratification scoring system that can be used for determining VTE risk of a patient undergoing orthopaedic procedures?

**RECOMMENDATION:** There is currently no validated risk score that can be used across all orthopaedic subspecialties. Most of the studies concerning risk scores have originated from joint replacement literature and generally use similar risk factors that classify patients as either high- or low risk. Unfortunately, none of these scores have been properly externally validated. They also lack any assessment of major bleeding events. Furthermore, the impact of these risk scores on patient outcomes and decision-making remains unknown. Additional studies are required to address these major limitations.

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## QUESTION 25: Is there a risk stratification system for predicting major bleeding events following orthopaedic procedures?

**RECOMMENDATION:** There is no formal risk stratification system available for predicting major bleeding events following orthopaedic procedures. A recent consensus statement limited to patients on chronic oral anticoagulation undergoing specific surgical procedures does stratify the risk of bleeding events (high, low/moderate, and minimal).

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## QUESTION 26: Is there a role for stratification of patients undergoing orthopaedic procedures for risk of bleeding? If so, should VTE prophylaxis be altered based on bleeding risk profile?

**RECOMMENDATION:** Given the incidence and severe outcomes of major bleeding events following orthopaedic procedures, there is definite need for risk stratification prior to surgery. While much attention has been put into identification of venous thromboembolism (VTE) risk factors and multiple guidelines exist attempting to mitigate this risk, major bleeding events (MBE) are serious complications that received less attention. Unjustifiably, MBE is often examined as a secondary outcome and therefore cohorts are too small to allow adequate statistical power for examining this issue. While current literature cannot support one chemoprophylaxis agent over the other in terms of MBE risk, it is important to consider that any potential benefit in terms of VTE risk reduction should be weighed against a potential increase in bleeding risk.

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## QUESTION 27: Is Thromboelastography (TEG) useful in predicting the risk of VTE in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** Although previously validated in other surgical subspecialties to predict venous thromboembolism (VTE), thromboelastography (TEG) has not been adequately trialed in patients undergoing orthopedic procedures. However, limited studies suggest that TEG is a useful adjunct for assessing orthopaedic hypercoagulopathy and VTE after traumatic injury and/or surgical intervention based upon a maximal amplitude (MA) > 65 mm.

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## QUESTION 28: Does lower extremity deep venous thrombosis arising after total joint arthroplasty propagate to cause pulmonary embolus?

**RECOMMENDATION:** Deep venous thrombosis (DVT) propagation, causing pulmonary embolus (PE), has been described in patients with unprovoked clots, and attributed to the prothrombotic phenotype of the individual. While it is recognized that a PE may arise from a DVT, a direct relationship between DVT propagation and a PE does not appear to exist for patients undergoing orthopedic procedures, in particular total joint arthroplasty (TJA).

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## QUESTION 29: How should patients with post-operative proximal (popliteal or supra-popliteal) DVT be managed?

**RECOMMENDATION:** In line with the current guidelines, we recommend that consideration should be given to treat proximal deep venous thrombosis (DVT), affecting popliteal or suprapopliteal vessels, arising acutely in patients undergoing orthopaedic procedures.

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## QUESTION 30: How should patients with post-operative distal DVT be managed?

**RECOMMENDATION:** In the absence of concrete evidence, the opinion of this workgroup is that patients with isolated distal deep venous thrombosis (DVT) can be monitored without treatment or treated by aspirin (ASA).

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## QUESTION 31: How should a patient with a soleal vein thrombosis detected after an orthopaedic procedure be managed?

**RECOMMENDATION:** There is little high-quality literature available regarding treatment of soleal vein thrombosis after orthopaedic surgery. The rate of propagation of soleal vein thrombosis to proximal veins is very low. Thus, these patients may be managed by close monitoring, which may include repeat imaging, and possible administration of aspirin (ASA).

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## QUESTION 32: When do venous thromboembolism (VTE) episodes occur after orthopaedic procedures?

**RECOMMENDATION:** The most critical period for venous thromboembolism (VTE) development is within the first month after orthopaedic surgery, but the risk of VTE may persist for longer.

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## QUESTION 33: Should a patient with active lower extremity DVT undergo an orthopaedic procedure?

**RECOMMENDATION:** There is limited scientific evidence to support the safety of orthopaedic surgery in a patient with an active deep venous thrombosis (DVT) or pulmonary embolism (PE). Thus, the management of these patients must be individualized based on the patient history, procedure, extent of the DVT/PE, physiologic parameters, and the risk of bleeding during and after surgery.

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## QUESTION 34: How long after a diagnosed DVT and/or PE can a patient undergo elective orthopaedic procedure?

**RECOMMENDATION:** In the absence of definitive evidence, the opinion of this workgroup is that elective orthopaedic surgery should be delayed by 6 months in patients with a recently diagnosed deep venous thrombosis (DVT) and/or pulmonary embolism (PE).

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## QUESTION 35: Are there adverse consequences of not treating acute lower extremity DVT in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** Available data suggests that patients with proximal (above knee) lower extremity deep venous thrombosis (DVT) may be at higher risk of pulmonary embolism (PE). From the limited evidence, it appears that the majority of patients with distal DVT may be left untreated with no adverse consequences.

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## QUESTION 36: Should venous thromboembolism (VTE) screening be performed in asymptomatic patients undergoing orthopaedic surgery?

**RECOMMENDATION:** Venous thromboembolism (VTE) screening with ultrasound is not recommended for asymptomatic patients before or after major orthopaedic surgery.

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## QUESTION 37: Are there specific clinical findings that are indicative of lower extremity DVT?

**RECOMMENDATION:** The clinical diagnosis of lower extremity deep venous thrombosis (DVT) is nonspecific and individual clinical findings are of limited value in diagnosing DVT.

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## QUESTION 38: Are there any serological biomarkers for the diagnosis of DVT/PE?

**RECOMMENDATION:** There are markers that can be used for detecting the presence of deep venous thrombosis/pulmonary embolism (DVT/PE). The most commonly used serological biomarker is the D-dimer. However, there are some other markers that are also available such as: PAI-1, SF, FDP, TAT and PF 1 + 2.

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## QUESTION 39: What is the optimal imaging modality for detection of upper and lower extremity DVT for patients undergoing orthopaedic procedures?

**RECOMMENDATION:** The optimal imaging modality for the detection of upper and lower extremity deep venous thrombosis (DVT) is venous compression ultrasonography (CUS). The choice between proximal leg, whole-leg, and serial CUS should be guided by an assessment of clinical pretest probability.

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## QUESTION 40: Is there a role for lower extremity venograms for the diagnosis of lower extremity DVT?

**RECOMMENDATION (1):** The use of lower extremity venograms for routine diagnosis of lower extremity deep venous thrombosis (DVT) is not recommended. For patients with suspicion of lower leg DVT requiring imaging, venous ultrasound (VUS) is recommended as the first diagnostic modality.

**RECOMMENDATION (2):** In patients with suspicion of iliac or vena cava thrombosis, as well as inconclusive or impossible to perform VUS, computer tomography venography (CTV) or magnetic resonance venography (MRV) should be performed, based on availability and center experience.

**RECOMMENDATION (3):** In the patients with strong suspicion for lower extremity DVT and inconclusive or impossible to perform VUS, examination of the veins below the inguinal ligament should be done with CTV, MRV or contrast phlebography.

**RECOMMENDATION (4):** In clinical trials with a study endpoint including the presence of lower leg asymptomatic DVT, the use of contrast venography may be performed as these are required by the regulatory bodies.

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## QUESTION 41: What is the most optimal imaging modality for diagnosis of pulmonary embolus (PE) following orthopaedic surgery?

**RECOMMENDATION:** Advances in imaging have resulted in an increased ability to visualize emboli in the lungs, some of which may be clinically non-significant and may even not be a true pulmonary embolism (PE). The “gold standard” for diagnosis of PE is still the computer tomography pulmonary angiography (CTPA).

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## QUESTION 42: Do pulmonary arterial filling defects seen on cross-sectional imaging of the lung always represent a pulmonary embolism (PE)?

**RECOMMENDATION:** Pulmonary arterial filling defects seen on cross-sectional imaging studies are not always indicative of pulmonary embolism (PE). There are several other conditions that can lead to arterial filling defects on cross-sectional imaging studies such as primary pulmonary arterial (PA) neoplasm, pulmonary vascular involvement of IgG4-related disease (IgG4-RD), Behcet's disease, Takayasu's arteritis (TA), Hughes–Stovin syndrome (HSS), and pulmonary arterial streak artifact.

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## QUESTION 43: Do all emboli detected on cross-sectional imaging of the lung lead to the same degree of oxygenation compromise (hypoxia)?

**RECOMMENDATION:** While current evidence suggests that not all emboli detected on cross-sectional imaging of the lung result in the same degree of hypoxia, evidence is conflicting regarding the association between emboli size and location to the degree of patient hypoxia. Providers should continue to risk stratify patients with acute pulmonary embolism (PE) by hemodynamic status and right ventricular dysfunction in accordance with the European Society of Cardiology (ESC) 2019 and the American Society of Hematology (ASH) 2020 guidelines for management of venous thromboembolism (VTE).

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## QUESTION 44: Is there an association between pulmonary embolus and secondary pulmonary hypertension after major orthopaedic surgery?

**RECOMMENDATION:** Chronic thromboembolic pulmonary hypertension (CTEPH) is strongly associated with prior pulmonary embolism (PE); however, this association has not been adequately explored following major orthopaedic surgeries. Given that PE is a known complication following orthopaedic surgery and incidence of CTEPH after PE is between 0.1% and 9.1%, evaluation for CTEPH after postsurgical PE should be considered to allow for early treatment, particularly pulmonary endarterectomy (PEA), and to prevent downstream sequelae and mortality.

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## QUESTION 45: Is administration of any venous thromboembolism (VTE) prophylaxis effective in reducing the risk of fatal pulmonary embolism (PE)?

**RECOMMENDATION:** There is no evidence that venous thromboembolism (VTE) prophylaxis reduces the risk of fatal pulmonary embolism (PE) in elective orthopaedic procedures, including lower limb joint replacement. In patients with a hip fracture, there is limited evidence that aspirin (ASA) may reduce fatal PE, but the strength of evidence does not support a recommendation.

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## QUESTION 46: What endpoint should be used to determine the efficacy of a venous thromboembolism (VTE) prophylactic agent?

**RECOMMENDATION:** The occurrence of symptomatic deep venous thrombosis (DVT) and pulmonary embolism (PE) should be used as an endpoint to evaluate the efficacy of a venous thromboembolism (VTE) prophylactic agent.

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## QUESTION 47: What is the optimal duration of VTE prophylaxis following major orthopaedic procedures?

**RECOMMENDATION:** Following major orthopaedic surgery venous thromboembolism (VTE) prophylaxis initiated in-hospital should be continued for 14 to 35 days after patient discharge.

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## QUESTION 48: What is the cost-efficacy of each VTE prophylactic agent that may be used in patients undergoing orthopaedic surgery?

**RECOMMENDATION:** Aspirin (ASA) is the most cost-effective venous thromboembolism (VTE) prophylaxis as the cost of drug is nominal, the rate of complications such as bleeding associated with administration of ASA is low, and there is no need for blood tests or other methods to monitor the agent. The cost-effectiveness of different methods of VTE prophylaxis depends mostly on the initial cost of the chemical or mechanical modality, the need for blood monitoring, rate of complications associated with administration of the modality, and the need for reversal agents. We recognize that the cost of various prophylactic agents varies widely across the globe.

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## QUESTION 49: Are there differences between various venous thromboembolism (VTE) prophylaxis in terms of patient compliance/adherence?

**RECOMMENDATION:** Although there is some variation in adherence to the various venous thromboembolism (VTE) prophylactic agents, most of the differences are explained by sociodemographic, socioeconomic, illness-related, patient-related, and medication-specific to health system-related factors. As a predictor of adherence, individual patient preferences present an opportunity to create value in person-centered care.

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## QUESTION 50: Is there a role for sequential combination VTE prophylaxis in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** Based on the available evidence, sequential combination venous thromboembolism (VTE) prophylaxis has not been shown to be superior to other established treatment regimens.

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## QUESTION 51: Are there specific contraindications for the administration of each VTE prophylactic agent?

**RECOMMENDATION:** Each venous thromboembolism (VTE) prophylactic agent has evidence-based relative and absolute contraindications, which should be considered and balanced with the patient's VTE risk.

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## QUESTION 52: Does VTE prophylaxis in patients with chronic kidney disease need to be altered when undergoing orthopaedic procedures?

**RECOMMENDATION:** In patients with chronic renal disease, pharmacological agents used in venous thromboembolism (VTE) prophylaxis may need a dose adjustment to prevent major bleeding or other complications based on their biochemical properties. In unstable advanced renal disease, unfractionated heparin (UFH) or mechanical prophylaxis alone may be preferred as VTE prophylaxis.

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## QUESTION 53: Does VTE prophylaxis in patients with chronic liver disease need to be altered when undergoing orthopaedic procedures?

**RECOMMENDATION:** Chronic liver disease (CLD) alone should not be considered a reason to withhold or alter venous thromboembolism (VTE) prophylaxis. The decision to possibly modify VTE prophylaxis should be multidisciplinary and individualized based on risk factors for both VTE and bleeding.

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## QUESTION 54: What are the indications for seeking a thrombosis specialist or a hematology consult for VTE prevention, in patients undergoing elective orthopaedic procedures?

**RECOMMENDATION:** In the absence of reliable evidence, it is the opinion of this work group that patients with known or suspected bleeding or coagulation disorder, creatinine clearance < 30 mL/min, active hepatobiliary disease, with significant anemia or thrombocytopenia or patients requiring continuous use of antiplatelet and/or anticoagulant might benefit from a thrombosis specialist or a hematology consult.

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## QUESTION 55: If a patient is in an "increased risk" group for the development of VTE, are there certain agents which have increased efficacy over other anticoagulants?

**RECOMMENDATION:** There is limited evidence to support that certain anticoagulants have increased efficacy over other anticoagulants. The specific factor that increases a patient's risk for venous thromboembolism (VTE) must be considered and treatment tailored to that specific cause, after considering drug class, and dosing regimen.

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## QUESTION 56: Should the perioperative VTE prophylaxis of a patient undergoing orthopaedic procedure who is diagnosed with acute atrial fibrillation be altered?

**RECOMMENDATION:** There is no evidence to indicate that the perioperative venous thromboembolism (VTE) prophylaxis of patients undergoing orthopaedic procedure and diagnosed with acute atrial fibrillation (AF) should be altered. However, according to the latest recommendations of the American Heart Association (AHA), the American College of Cardiology (ACC), the Heart Rhythm Society (HRS), and the European Society of Cardiology (ESC), the patients with AF, and high risk of embolic events should receive anticoagulation therapy.

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## QUESTION 57: What is the most optimal management of a patient with elevated coagulation parameters, such as high INR, undergoing emergency orthopaedic surgery?

**RECOMMENDATION:** In patients on vitamin K antagonist (VKA) with an elevated international normalized ratio (INR) requiring emergency orthopaedic surgery, we suggest correction to an INR  $\leq 1.5$ .

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## QUESTION 58: What is the optimal VTE prophylaxis modality for patients with bleeding disorders such as hemophilia or Von Willebrand disease?

**RECOMMENDATION:** Mechanical venous thromboembolism (VTE) prophylaxis is most appropriate for patients with bleeding disorders undergoing orthopaedic surgery. However, the addition of mild pharmacologic VTE prophylaxis should be considered for select patient groups that may express a higher prothrombotic phenotype, and in those using clotting factor concentrates bypassing agents or monoclonal antibodies that may increase the risk of thrombosis.

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## QUESTION 59: What is the optimal VTE prophylaxis modality for patients with clotting disorders such as thrombophilia?

**RECOMMENDATION:** Patients with thrombophilia should receive venous thromboembolism (VTE) prophylaxis for major orthopaedic surgery. We recommend a combination of mechanical and pharmacological interventions for up to 35 days after the procedure to address the variability of VTE risk, which is difficult to estimate in frequency and magnitude. For less invasive musculoskeletal procedures, the VTE prophylaxis should be tailored according to the prothrombotic risk of each procedure, with emphasis on those of lower extremities.

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## QUESTION 60: What are the indications for use of an IVC filter in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** Inferior vena cava (IVC) filters may be considered for patients who have a high risk of venous thromboembolism (VTE) and in whom chemical anticoagulation is contraindicated. IVC filters should not be used on a routine basis for deep venous thrombosis (DVT) prophylaxis, particularly when chemical prophylaxis can be administered.

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## QUESTION 61: Does the availability of reversal agents influence the choice of a selected chemical VTE prophylaxis agent?

**RECOMMENDATION:** Yes. Commonly used venous thromboembolism (VTE) prophylaxis agents have acceptable safety profiles as well as established guidelines for reversal. Some agents may be safely continued during surgery (e.g., aspirin [ASA], clopidogrel), while others can be promptly reversed by discontinuation (e.g., low-molecular-weight heparin [LMWH]). Other agents such as vitamin K antagonists (e.g., warfarin) and direct-oral anticoagulants (DOAC) require a longer discontinuation interval before surgery. The reversal agents such as Prothrombin Complex Concentrates as well as specific antidotes such as idarucizumab and endexine alfa, with limited availability may need to be administered for emergency cases. As such, the availability and cost of reversal agents are important factors that influence the choice of VTE prophylactic agent.

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## QUESTION 62: Does post-operative rehabilitation protocol such as early ambulation influence the incidence of VTE after orthopaedic procedures?

**RECOMMENDATION:** It is the opinion of this group that early ambulation reduces the incidence of venous thromboembolism (VTE) after orthopaedic procedures.

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## QUESTION 63: What is the most optimal VTE prophylaxis for patients who are on strict bed rest pre- or post-operatively?

**RECOMMENDATION:** The most optimal thromboprophylaxis in patients on strict bed rest is not known. Any combination of chemical and/or mechanical (i.e., intermittent compression devices) prophylaxis may be considered in patients who will be on prolonged and strict bed rest.

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## QUESTION 64: Is there a role for the use of intermittent compression devices as VTE prophylaxis for patients undergoing orthopaedic procedures?

**RECOMMENDATION:** Yes. Intermittent compression devices (ICD) provide protection against venous thromboembolism (VTE) development following orthopaedic surgery. Utilizing these devices has been shown to be an effective prophylactic measure.

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## QUESTION 65: Is a foot pump as effective as a lower extremity intermittent compression device for VTE prophylaxis?

**RECOMMENDATION:** The use of a foot pump is as effective as a lower extremity intermittent compression device, when used in combination with chemical prophylaxis.

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## QUESTION 66: Is there a role for the use of compression stockinette, as VTE prophylaxis, in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** Elastic compression stockinette may provide some protection against venous thromboembolism (VTE).

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## QUESTION 67: Is there a difference between different types of intermittent pneumatic compression devices (IPCD)?

**RECOMMENDATION:** The current evidence does not demonstrate notable differences in the clinical outcomes between different types of intermittent pneumatic compression devices (IPCD). However, devices with patient monitoring sensors and sequential compression may improve patient compliance.

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## QUESTION 68: In patients with confirmed acute distal DVT, should a mechanical compression device be discontinued in the affected limb?

**RECOMMENDATION:** The practitioner might continue the mechanical compression device (MCD) in patients with an acute distal deep venous thrombosis (DVT), in combination with the DVT treatment protocol (anticoagulation) as recommended in current guidelines.

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## QUESTION 69: What is the optimal management of patients who are on antiplatelet medications prior to an elective orthopaedic procedure?

**RECOMMENDATION:** There is insufficient evidence to recommend continuing or discontinuing antiplatelet medications prior to an elective orthopaedic procedure. Literature pertaining to this subject is of low quality and most studies pertain only to aspirin (ASA) and do not investigate other antiplatelet medications such as clopidogrel, ticagrelor, prasugrel, etc. Higher quality studies are needed before more definitive recommendations can be made.

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## QUESTION 70: What is the optimal management of patients who are on antiplatelet medications prior to an emergency orthopaedic procedure?

**RECOMMENDATION:** There is no evidence to support delaying emergent orthopaedic procedure in patients on antiplatelet medications. However, literature pertaining to this topic is of low quality with no randomized controlled trials (RCT) to date and most studies focus on hip fracture surgery. These studies primarily concentrate on aspirin (ASA), and/or clopidogrel with few investigations about other antiplatelet medications like ticagrelor, prasugrel, etc. Higher quality research is needed before a more definitive recommendation can be made.

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## QUESTION 71: Should aspirin be stopped pre-operatively in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** Aspirin (ASA), administered for cardiovascular reasons, should not routinely be stopped in patients undergoing orthopaedic procedures. Continuation of ASA is likely to be cardioprotective and unlikely to be associated with increased blood loss.

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## QUESTION 72: When should chronic anticoagulation be stopped in patients undergoing elective orthopaedic procedures?

**RECOMMENDATION:** Acenocoumarol should be stopped 3 days, warfarin and fluindione should be stopped 5 days, and phenprocoumon should be stopped 7 days prior to elective orthopedic surgery. Direct-acting oral anticoagulants (DOAC) (apixaban, edoxaban, dabigatran, and rivaroxaban) should be stopped at least two days prior to elective orthopedic surgery with an additional day added for dabigatran in patients with a creatinine clearance (CrCl) < 80 mL/min and two to three additional days for patients with a CrCl > 30 mL/min but < 50 mL/min.

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## QUESTION 73: Should bridging by an injectable anticoagulation be considered in patients who are on chronic anticoagulation prior to undergoing elective orthopaedic procedures?

**RECOMMENDATION:** Patients on chronic oral anticoagulation for venous thromboembolism (VTE) prevention or non-valvular atrial fibrillation should not be bridged with low-molecular-weight heparin (LMWH) or intravenous unfractionated heparin prior to orthopaedic procedures. Several high-quality studies demonstrate an increased risk of perioperative bleeding complications with no difference in thromboembolic events in patients undergoing bridging anticoagulation therapy. For patients on oral anticoagulation for prosthetic heart valve, bridging should be considered weighing the patient's risk of thromboembolic events versus the risk of bleeding. However, a recent randomized controlled clinical trial which included 305 patients with mechanical heart valves demonstrated no benefit to bridging therapy.

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## QUESTION 74: Is there a difference between low dose and regular dose aspirin for the prevention of VTE following orthopaedic procedures?

**RECOMMENDATION:** There seems to be no difference in the efficacy of low dose and regular dose aspirin (ASA) for the prevention of venous thromboembolism (VTE) following orthopaedic procedures. However, tolerability and gastrointestinal side effect profile of low dose ASA is more favorable.

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## QUESTION 75: What VTE prophylaxis should be administered to a patient who is allergic to aspirin?

**RECOMMENDATION:** In light of the advantageous safety profile and cost-effectiveness of aspirin (ASA) for prevention of venous thromboembolism (VTE), a detailed workup to confirm true hypersensitivity to ASA should be strongly considered unless systemic allergic reactions have been reported. Patients determined to have true aspirin-exacerbated respiratory disease (AERD) or mucocutaneous reactions may then undergo a desensitization protocol. On the rare occasion that a patient has a systemic allergic reaction to ASA, desensitization should be avoided, and alternative agents for VTE prophylaxis should be used.

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## QUESTION 76: Can non-steroidal anti-inflammatory drugs (NSAIDs) be used as prophylactic agents against VTE in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** There is inadequate evidence to support the use of non-steroidal anti-inflammatory drugs (NSAIDs) as sole pharmacological agents to prevent venous thromboembolism (VTE) in patients undergoing orthopaedic surgery.

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## QUESTION 77: Can NSAIDs be co-administered with aspirin, when used as a VTE prophylaxis, in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** Non-steroidal anti-inflammatory drugs (NSAID) ingested together with aspirin (ASA) may reduce the antithrombotic activity of ASA. This effect is greater with the use of non-selective NSAID. Therefore, ASA should be taken at least 2 hours before taking NSAID.

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## QUESTION 78: Are there differences between various Factor Xa inhibitors in prevention of VTE with regard to efficacy and safety profile?

**RECOMMENDATION:** There is insufficient data to demonstrate superiority for one Factor Xa inhibitor over another as venous thromboembolism (VTE) prophylaxis.

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## QUESTION 79: Are there any blood tests that can be used to monitor the activity/efficacy of factor Xa inhibitors used as VTE prophylaxis?

**RECOMMENDATION:** Activated partial thromboplastin time (aPTT) and prothrombin time (PT) can be used to monitor the activity of unfractionated heparin and vitamin K antagonists respectively. Neither the aPTT nor the international normalized ratio (INR) can be reliably used to monitor the activity of factor Xa inhibitors. The application of chromogenic anti-Xa assays is reliable for assessing the activity of factor Xa inhibitors in serum or plasma. No therapeutic ranges of anti-Xa assays are available, either for prevention or for therapy.

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## QUESTION 80: Does warfarin cause hypercoagulable state during initial administration?

**RECOMMENDATION:** The available literature suggests that the administration of warfarin leads to a temporary hypercoagulable state.

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## QUESTION 81: Is there a role for bridging with another therapeutic anticoagulant after orthopaedic surgery when warfarin is used for VTE prophylaxis?

**RECOMMENDATION:** Patients on warfarin undergoing elective orthopaedic surgery should not routinely be bridged with unfractionated heparin (UFH) or low-molecular-weight heparin (LMWH). In patients with comorbid conditions, such as a mechanical heart valve, where risks of thromboembolic events may outweigh the risk of bleeding, bridging may be considered.

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## QUESTION 82: Are there differences between various injectable pharmacological agents for VTE prophylaxis with regard to efficacy and safety profile?

**RECOMMENDATION:** Compared to low-molecular-weight heparin (LMWH) and unfractionated heparin (UFH), fondaparinux appears to have a better efficacy profile for prevention of venous thromboembolism (VTE) following orthopaedic procedures. Based on current evidence, there appears to be no difference in the safety profile of the different injectable pharmacological agents in terms of perioperative bleeding risk.

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## QUESTION 83: What is the optimal timing for the start of LMWH as a VTE prophylaxis in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** The optimal timing for the initiation of low-molecular-weight heparin (LMWH) for venous thromboembolism (VTE) prophylaxis in patients undergoing orthopaedic procedures is 12 - 24 hours after surgery. Although high quality evidence is lacking, several studies have identified an increased risk of postoperative bleeding when LMWH is given preoperatively or immediately postoperatively. Concerns also exist for earlier initiation of LMWH in patients undergoing neuraxial anesthesia. There seems to be no benefit in starting LMWH preoperatively vs (>12 hours) postoperatively. Exact timing for a specific procedure, particularly trauma patients or those at risk for VTE, should be in accordance with the chosen LMWH pharmacokinetics, surgeons/anesthesiologists' preferences, and patient comorbidities.

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## QUESTION 84: Should the dose of LMWH for the prevention of VTE be weight-adjusted?

**RECOMMENDATION:** Limited data suggests that weight-adjusted dosing of low-molecular-weight heparin (LMWH) may be of benefit in venous thromboembolism (VTE) prophylaxis for very low body weight and obese patients.

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## QUESTION 85: Does the administration of VTE prophylaxis to patients undergoing orthopedic procedures increase the rate of post-operative non-VTE complications?

**RECOMMENDATION:** Administration of pharmacological venous thromboembolism (VTE) prophylaxis to patients undergoing total hip arthroplasty (THA) and total knee arthroplasty (TKA) increases the rate of post-operative bleeding complications. Aspirin carries the lowest risk. The literature is inconclusive for other orthopaedic procedures.

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## QUESTION 86: Does the administration of VTE prophylaxis increase the risk for intracranial bleeding in patients undergoing orthopaedic procedures? If so, are there differences between the various prophylactic agents?

**RECOMMENDATION:** There is a known association between the use of antithrombotic drugs and the risk of intracranial bleeding in patients receiving long-term treatment. Intracranial bleeding has been less commonly reported in patients undergoing orthopaedic procedures, probably because of the shorter time of exposure to antithrombotic drugs. The incidence of intracranial bleed seems to be higher with the use of vitamin K antagonists (VKA).

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## QUESTION 87: Does the administration of VTE prophylaxis increase the risk for epidural hematoma in patients undergoing orthopaedic procedures? If so, are there differences between the various agents?

**RECOMMENDATION:** Epidural hematoma (EH) is a rare but serious complication of neuraxial anesthesia. Venous thromboembolism (VTE) prophylaxis for total joint arthroplasty (TJA) has been associated with cases of EH and low-molecular-weight heparin (LMWH) appears to carry the greatest risk of the agents currently used. EH has also been associated with the use of direct-oral acting anticoagulants (DOAC).

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## QUESTION 88: Does the risk of post-operative wound problems in patients undergoing orthopaedic procedures differ between various VTE prophylactic agents?

**RECOMMENDATION:** Yes, aspirin (ASA) appears to confer a lower risk of postoperative wound problems compared to other chemoprophylactic agents.

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## QUESTION 89: Should the VTE prophylaxis be altered in patients undergoing orthopaedic procedures who develop wound related problems?

**RECOMMENDATION:** Yes. It is recommended to either hold anti-coagulation or change to a less aggressive anticoagulation agent in cases of wound related problems such as persistent wound drainage, bleeding, or hematoma formation.

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## QUESTION 90: Does the development of a hematoma as a result of the administration of VTE prophylaxis increase the risk of subsequent arthrofibrosis?

**RECOMMENDATION:** There is a lack of robust data to link the use of VTE prophylaxis and arthrofibrosis. One retrospective study demonstrated an increased risk of manipulation under anesthetic/lysis of adhesions after anterior cruciate ligament reconstruction (ACLR) in patients receiving VTE prophylaxis with an agent other than aspirin (ASA), as compared to patients receiving no thromboprophylaxis.

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## QUESTION 91: Is there a role for empirical treatment of patients with suspected, but not confirmed, VTE in the postoperative period?

**RECOMMENDATION:** Empirical systemic treatment with anticoagulation for suspected venous thromboembolism (VTE) in the post-operative period should only be initiated when timely image-based diagnosis cannot be achieved. Early treatment reduces the risk of VTE-associated morbidity. However, the increased bleeding risk with recent surgery should also be considered. Initiation of anticoagulation is ultimately a clinical decision, and a comprehensive risk benefit assessment should be undertaken based on individual patient factors.

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## QUESTION 92: What is the most appropriate method to monitor patients with confirmed post-operative VTE?

**RECOMMENDATION:** Although it is not entirely clear whether venous thromboembolism (VTE) should be monitored after orthopaedic surgery, in selected patients suffering VTE due to persistent risk factors, the preferred method should be serial ultrasonography with or without serum D-dimer quantification.

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## QUESTION 93: Should the post-operative rehabilitation of a patient with confirmed PE be modified?

**RECOMMENDATION:** Following orthopaedic surgery, when a diagnosis of pulmonary embolism (PE) has been made and the patient is therapeutically anticoagulated, post-operative rehabilitation should proceed without delay. In patients who have high/intermediate risk PE, the rehabilitation, not only should address regaining function of the operated area, but also should include respiratory training and closely monitored aerobic exercise to gradually increase the pulmonary functional capacity and the patient's quality of life. This recommendation is made in the absence of evidence that an early mobilization or rehabilitation program is associated with a higher risk of adverse events (namely recurrent PE or bleeding), and that there are clear established benefits to rehabilitation. We recognize that some patients who have PE may have poor cardio-pulmonary tolerance or other medical complications, and for these patients, the exercise regimen may need to be modified based on symptoms.

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## QUESTION 94: Should the post-operative rehabilitation of patients who have confirmed symptomatic VTE be modified?

**RECOMMENDATION:** There is no evidence to support modifying or changing the post-operative rehabilitation protocol for a patient with symptomatic venous thromboembolism (VTE).

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## QUESTION 95: Is there a role for thrombolysis in the management of patients with post-operative VTE?

**RECOMMENDATION:** Despite the lack of evidence in the literature to establish a role for thrombolysis in patients with postoperative venous thromboembolism (VTE), there is a potential role for thrombolysis among select patients. Thrombolysis should be considered, with attention to iatrogenic bleeding and hematoma risk, among postoperative patients in the following circumstances:

1. Limb threatening deep venous thrombosis (DVT) with acute limb ischemia (e.g., phlegmasia cerulea dolens).
2. For selected patients at low risk for bleeding with symptomatic DVT involving the iliofemoral veins and at higher risk for severe post thrombotic syndrome (PTS).

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## QUESTION 96: Are patients with prior history of COVID-19 who undergo orthopaedic procedures at an increased risk of VTE? If so, should their post-operative anticoagulation regimen be altered?

**RECOMMENDATION:** It is generally known that the severe acute respiratory syndrome-related coronavirus (SARS-CoV [COVID-19]) infection predisposes individuals to a higher risk of thromboembolism. However, there is not sufficient data to suggest that a previous COVID-19 infection increases the risk of venous thromboembolism (VTE) after an orthopaedic procedure. Thus, the VTE prophylaxis of patients with prior COVID-19 does not need to be altered.

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## QUESTION 97: Does the risk for VTE increase after COVID-19 vaccination?

**RECOMMENDATION:** The risk of venous thromboembolism (VTE) in individuals receiving the severe acute respiratory syndrome-related coronavirus (SARS-CoV [COVID-19]) vaccination is similar to the general population. A rare but drastic side effect of adenoviral COVID-19 vector vaccines is the development of venous thrombosis at unusual sites, such as the brain or abdomen, accompanied by thrombocytopenia. Because the mechanism is still unclear and similarity was observed with heparin-induced thrombocytopenia (HIT), treatment of such thrombus should include non-heparin anticoagulants and intravenous immunoglobulin.

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## QUESTION 98: Do clinical practice guidelines set the standard of care for VTE prophylaxis?

**RECOMMENDATION:** The development of the current clinical practice guidelines (CPG) which followed the Delphi method, thus removing the potential for bias, may set the "standard of care" in venous thromboembolism (VTE) prophylaxis in orthopaedic surgery, since for the first time, they cover all subspecialties in orthopaedics.

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PART II

# Foot & Ankle

<監訳者>

池 裕之、稲葉 裕、尾崎 敏文、山田 和希



**CQ1：糖尿病性足潰瘍の外科的デブリドマンを受ける患者は、ルーチンのVTE予防を受けるべきか？**

著者：Azlina A. Abbas, Steven M. Raikin 翻訳者：雑賀建多

**推奨：**潰瘍のデブリドマンを受ける糖尿病患者にVTE予防が必要かどうかを判断するエビデンスは、現在のところ存在しない。しかし、糖尿病性足潰瘍（DFU）患者がVTEを発症した場合、合併症の頻度と死亡率が上昇するリスクがある。したがって、特に運動機能の低下や他の内科的合併症がある場合、DFU患者に血栓予防薬を投与することを提案するのは正当なことである。しかし、長期間の荷重制限を必要としない場合、追加的な介入を行わずにDFUの外科的デブリドマンのみを行う症例には必ずしも当てはまらない。

エビデンスレベル：Limited

投票結果：賛成 100.00%、反対 0.00%、棄権 0.00%（満場一致の強いコンセンサス）

**CQ2：ウォーカーブーツで固定されている患者に対して、ルーチンのVTE予防は必要か？**

著者：William Fishley, Allison L. Boden, Rajesh Kakwani, Amithab Aiyer 翻訳者：雑賀建多

**推奨：**ウォーカーブーツで固定されている患者は、VTE発生リスクが高い可能性がある。患者をリスク評価し、個別にVTE予防策を提供する必要がある。

エビデンスレベル：Limited

投票結果：賛成 96.30%、反対 0.00%、棄権 3.70%（強いコンセンサス）

**CQ3：足部・足関節手術後の荷重負荷の状態は、VTE予防策の選択に影響があるか？**

著者：Thomas I. Sherman, Paul W. Ackermann 翻訳者：雑賀建多

**推奨：**下肢の荷重制限は、VTE発生の独立した危険因子である。このリスクは、手術肢の荷重負荷が50%以上であれば軽減される。これまでの文献からは、非荷重に関連するVTE予防策の選択に関して、追加の結論は出せない。

エビデンスレベル：Limited

投票結果：賛成 100.00%、反対 0.00%、棄権 0.00%（満場一致の強いコンセンサス）

**CQ4：VTEリスクについて、足部・足関節手術では、どの手術のリスクが高く、どの手術のリスクが低いと言えるのか？**

著者：Daniel Guss, Christopher W. DiGiovanni, Steven M. Raikin 翻訳者：雑賀建多

**推奨：**術後のVTE発生リスクについて、足部・足関節のどの手術を高リスクまたは低リスクとするかについての十分なデータは存在しない。アキレス腱断裂などの特定の診断では、VTE発生率が高いようだが、これは手術や保存療法とは無関係で、むしろ静脈還流の障害に関係している可能性がある。足部・足関節手術後のVTEリスクを理解するには、患者固有の危険因子が重要であり、年齢が50歳を超えていること、スプリントまたはキャストによる外固定、Charlson Comorbidity Index (CCI) > 2、静脈瘤、VTEの既往、凝固能亢進性の障害、炎症性関節炎などが含まれると考えられる。

エビデンスレベル：Limited

投票結果：賛成 100.00%、反対 0.00%、棄権 0.00%（満場一致の強いコンセンサス）

**CQ5：全荷重が許可される前足部・中足部の手術を受ける患者にルーチンでのVTE予防は必要か？**

著者：Daniel Scott, Caroline P. Hoch, Terence S. Saxby, Christopher E. Gross 翻訳者：山田俊介

**推奨：**前足部および中足部の手術後のVTE発生のリスクは低く、PE、なかでも特に致命的なPEは極めて稀である。前足部と中足部の手術後の発生率は共に低い、前足部の方が更に発生率が低い。リスクの低い患者における前足部および中足部の選択的手術後では、VTE予防のためのルーチンでの抗凝固薬使用は、特に早期荷重後には推奨しない。ルーチンでのVTEの薬物的予防法に関するさらに質の高い研究が進むことが推奨される。

エビデンスレベル：Limited

投票結果：賛成 100.00%、反対 0.00%、棄権 0.00%（満場一致の強いコンセンサス）

**CQ6：アキレス腱修復術を受ける患者にルーチンのVTE予防は必要か？**

著者：David T. Loveday, Nicholas J.O. Hutt, Veronica Roberts, Rajesh Kakwani 翻訳者：山田俊介

**推奨：**具体的エビデンスには欠けるが、VTEリスクが高い患者（リスク層別化スコアで判断）であれば、禁忌でない限り、VTE予防（理学的および/または薬物的）が推奨される。現状、アキレス腱修復術を受ける患者にルーチンでのVTEの薬物的予防を推奨する文献はない。

エビデンスレベル：Weak

投票結果：賛成 100.00%、反対 0.00%、棄権 0.00%（満場一致の強いコンセンサス）

**CQ7：足関節や後足部の固定術を受ける患者にルーチンの VTE 予防は必要か？**

著者：Christopher E. Gross, Caroline P. Hoch, Mathias Granqvist, Paul W. Ackermann 翻訳者：山田俊介

**推奨：**足関節や後足部の固定術後の VTE リスクは低く、PE、なかでも特に致命的な PE は極めて稀である。リスクの低い患者における足関節や後足部の選択的固定術後では、VTE 予防のためのルーチンでの抗凝固薬使用は推奨しない。足部、足関節術後のルーチンでの VTE の薬物的予防法に関するさらに質の高い研究が進むことが推奨される。

**エビデンスレベル：**Limited

**投票結果：**賛成 96.30%、反対 0.00%、棄権 3.70%（強いコンセンサス）

**CQ8：人工足関節置換術を受ける患者にルーチンの VTE 予防は必要か？**

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**推奨：**人工足関節置換術（TAA）後の VTE 発生に対する薬物的予防の役割については矛盾したデータが存在する。薬物的予防を導入しない場合の TAA 後の VTE 発生率は、人工股関節置換術や人工膝関節置換術後の発生率よりも大幅に低いが、無視できない値である。VTE の既往や血栓形成傾向がある一部の患者では、薬物的予防が必要となるほど VTE リスクが高くなる可能性がある。周術期における薬物的予防のリスク対効果比と同様に、長期の膝下固定または非荷重の影響をさらに解明する必要がある。

**エビデンスレベル：**Limited

**投票結果：**賛成 100.00%、反対 0.00%、棄権 0.00%（満場一致の強いコンセンサス）

## QUESTION 1: Should patients undergoing surgical debridement of diabetic foot ulcers receive routine VTE prophylaxis?

**RECOMMENDATION:** There is currently no evidence in the literature to determine if a diabetic patient undergoing ulcer debridement requires venous thromboembolism (VTE) prophylaxis. There is, however, an increased risk for morbidity and mortality in diabetic foot ulcers (DFU) patients who develop VTE. Therefore, it is justified to propose that patients with DFU are given thromboprophylaxis, particularly if they have reduced mobility and other medical comorbidities. This may not be true for all cases of surgical debridement alone of DFU without additional interventions when prolonged limited weight-bearing is not required.

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## QUESTION 2: Is routine VTE prophylaxis needed for patients placed in walker boot immobilization?

**RECOMMENDATION:** Patients in walker boot immobilization may be at increased risk of development of venous thromboembolism (VTE). Patients should be risk assessed, and VTE prophylaxis offered on an individual basis.

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## QUESTION 3: Does the weight-bearing status of the patient after foot and ankle surgery influence the selection of VTE prophylaxis?

**RECOMMENDATION:** Non-weight-bearing restrictions of the lower extremity are an independent risk factor for venous thromboembolic (VTE) events. This risk is mitigated by load-bearing of the operative limb greater than 50%. No additional conclusions can be made regarding the selection of VTE prophylaxis as it relates to non-weight-bearing based on the available literature.

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## QUESTION 4: Concerning VTE risk, which surgeries can be considered major, and which surgeries can be considered non-major in foot and ankle surgery?

**RECOMMENDATION:** There is insufficient data to characterize foot and ankle surgical procedures as either major or non-major risk with regard to postoperative venous thromboembolic (VTE) event risk. Certain diagnoses, such as achilles rupture, do seem to demonstrate a higher rate of VTE, but this may be independent of surgical or non-surgical management and instead relate to impaired venous return. Patient-specific risk factors are critical towards understanding the risk of VTE after foot and ankle (F&A) surgery, and may include age > 50 years, splint or cast immobilization, Charlson Comorbidity Index (CCI) > 2, varicose veins, history of VTE, hypercoagulability disorder, and inflammatory arthritis.

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## QUESTION 5: Is routine VTE prophylaxis required for patients undergoing forefoot and midfoot surgery who would be allowed to fully weight-bear?

**RECOMMENDATION:** The risk of venous thromboembolism (VTE) following forefoot and midfoot is rare, with pulmonary embolism (PE) and even more so, fatal PE being exceedingly rare. The rates appear to be lower in forefoot surgery as opposed to midfoot surgery, while both appear low. We do not recommend routine anticoagulants for VTE prevention following elective a forefoot and midfoot in low-risk patients, especially after immediate weight-bearing. We do encourage further high-quality research into routine VTE chemoprophylaxis.

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## QUESTION 6: Is routine VTE prophylaxis needed for patients undergoing achilles tendon repair?

**RECOMMENDATION:** In the absence of concrete evidence, we recommend that venous thromboembolism (VTE) prophylaxis (mechanical and/or chemical) be administered to patients at high risk of VTE (as determined by the risk stratification scores), unless contraindicated. Routine administration of chemoprophylaxis for patients undergoing achilles repair is not supported with the current literature.

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## QUESTION 7: Is there a role for routine VTE prophylaxis undergoing ankle and/or hindfoot fusion?

**RECOMMENDATION:** The risk of venous thromboembolism (VTE) following ankle or hindfoot fusion surgery is rare, with pulmonary embolism (PE) and even more so, fatal PE being exceedingly rare. We cannot recommend routine anticoagulants for VTE prevention following elective ankle/hindfoot fusion in low-risk patients. We do encourage further high-quality research into routine VTE chemoprophylaxis following foot and ankle (F&A) surgery.

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## QUESTION 8: Is routine VTE prophylaxis required for patients undergoing total ankle arthroplasty?

**RECOMMENDATION:** There is contradictory data on the role of chemoprophylaxis for the prevention of venous thromboembolism (VTE) events after total ankle arthroplasty (TAA). VTE rates after TAA appear to be substantially lower than those after total hip or knee arthroplasty in the absence of chemoprophylaxis, but they are certainly not negligible. Subpopulations of patients such as those with a prior history of VTE or known thrombophilia may be at sufficiently heightened risk to justify chemoprophylaxis. The implications of prolonged below-knee immobilization or non-weightbearing as well as the risk-benefit ratio of chemoprophylaxis in the perioperative setting needs to be further elucidated.

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PART III

# Hand & Wrist

<監訳者>

赤木 将男、池 裕之、稲葉 裕



**CQ 1 : VTE リスクに関して、手外科手術の中でどのような手術が高リスク・低リスクと考えられるか？**

著者 : Jacob E. Tulipan, Pedro Beredjikian 翻訳者 : 田中寛樹、柿木良介

**推奨 :** 90 分を超える全身麻酔手術、術後安静臥床や歩行制限が必要な手術、再接着または血管柄付き遊離組織移植手術は、手外科領域での VTE リスクの高い手術と考えられるべきである。**エビデンスレベル :** Consensus**投票結果 :** 賛成 90.48%、反対 4.76%、棄権 4.76% (強いコンセンサス)**CQ 2 : 手関節の手術を受ける患者にルーチンの VTE 予防は必要か？**

著者 : Jacob E. Tulipan, Pedro Beredjikian 翻訳者 : 田中寛樹、柿木良介

**推奨 :** 手関節の手術を受ける患者にルーチンの VTE 予防は必要ない。VTE に対する強い家族歴のある患者や周術期に歩行できない患者では考慮すべきである。**エビデンスレベル :** Limited**投票結果 :** 賛成 95.45%、反対 0.00%、棄権 4.55% (強いコンセンサス)**CQ 3 : 手指の手術を受ける患者にルーチンの VTE 予防は必要か？**

著者 : Jacob E. Tulipan, Pedro Beredjikian 翻訳者 : 田中寛樹、柿木良介

**推奨 :** 手指または母指の手術を受ける患者にルーチンの VTE 予防は必要ない。長時間の手指再接着術または微小血管手術を受ける患者では、VTE 予防が必要となり得る。**エビデンスレベル :** Limited**投票結果 :** 賛成 90.91%、反対 4.55%、棄権 4.55% (強いコンセンサス)**CQ 4 : 手部及び手関節の手術を行う前に、抗凝固薬を中断する必要があるか？**

著者 : Geert Meermans, Amy C. Lu, Patricia Fogarty Mack, Christopher M. Jones 翻訳者 : 田中寛樹、柿木良介

**推奨 :** 手部及び手関節の手術を受ける患者において、特に VTE の高リスク患者や手根管手術を受ける患者では、抗血小板薬や抗凝固薬を中断する必要はない。**エビデンスレベル :** Moderate**投票結果 :** 賛成 90.91%、反対 4.55%、棄権 4.55% (強いコンセンサス)

## QUESTION 1: Concerning VTE risk, which surgeries can be considered major, and which surgeries can be considered non-major in hand surgery?

**RECOMMENDATION:** Surgeries involving general anesthesia for >90 minutes, surgeries requiring bedrest or limited ambulation postoperatively, and surgeries involving replantation or free vascularized tissue transfer should be considered major in Hand Surgery.

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## QUESTION 2: Is routine VTE prophylaxis required for patients undergoing wrist surgery?

**RECOMMENDATION:** Routine venous thromboembolism (VTE) prophylaxis is not required for patients undergoing wrist surgery. It should be considered in patients with strong family history of VTE or patients who are unable to ambulate perioperatively.

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## QUESTION 3: Is routine VTE prophylaxis required for patients undergoing finger surgery?

**RECOMMENDATION:** Thromboprophylaxis is not routinely required for patients undergoing finger or thumb surgery. In patients undergoing digit replantation or microvascular surgery with extended operative time, venous thromboembolism (VTE) prophylaxis may be indicated.

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## QUESTION 4: Should anticoagulants be held prior to performing hand and wrist surgeries?

**RECOMMENDATION:** Antiplatelet and anticoagulant medication do not need to be discontinued in patients undergoing hand and wrist surgeries, especially in patients at high-risk of venous thromboembolism (VTE) and those undergoing carpal tunnel surgery.

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PART IV

# Hip & Knee

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<監訳者>

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## CQ1: 待機的 TJA 後の VTE は Never Event (病院側の責任が問われる予防可能な有害事象) とみなすべきか?

著者: Michael M. Meghpara, James J. Purtill, Richard Iorio, Thomas Jakobsen 翻訳者: 眞島任史

推奨: 待機的 TJA 後の VTE は、さまざまな予防戦略にもかかわらず発生し続けており、Never Event と見なすべきではない。

エビデンスレベル: Moderate

投票結果: 賛成 94.87%、反対 5.13%、棄権 0.00% (強いコンセンサス)

## CQ2: THA または TKA を受ける患者の VTE の危険因子に違いはあるか?

著者: Francisco Bengoa, Henrik Malchau, Juan José Pellegrini, Agustín Vial, Søren Overgaard 翻訳者: 眞島任史

推奨: TKA を受ける患者は、THA 患者に比べて VTE リスクが高い。さらに、VTE は TKA 患者で早期に発症する傾向がある。THA または TKA を受けている患者間で危険因子が異なるというエビデンスはない。また、TKA を THA 患者とは異なるよう層別化する必要があるかどうか、またはその方法については明確ではない。

エビデンスレベル: Limited

投票結果: 賛成 93.04%、反対 4.35%、棄権 2.61% (強いコンセンサス)

## CQ3: TKA / THA 後の最適な VTE 予防法はなにか?

著者: Saad Tarabichi, Matthew B. Sherman, Kerri-Anne Ciesielka, Colin M. Baker, Javad Parvizi 翻訳者: 眞島任史

推奨: 低用量アスピリンは現在、TJA を受ける患者の VTE に対する最も効果的で安全な予防法である。中等度から高リスクの患者を含む、TJA を受けるすべての患者における VTE 予防の主要な方法として、低用量のアスピリンを使用することを勧める。

エビデンスレベル: Strong

投票結果: 賛成 76.92%、反対 19.66%、棄権 3.42% (強いコンセンサス)

## CQ4: 両側同時 TKA (SBTKA) を受ける患者に最適な予防薬は何か?

著者: Graham S. Goh, Leanne Ludwick, Andrea Baldini 翻訳者: 眞島任史

推奨: SBTKA を受ける患者は、片側 TKA を受ける患者と比較して VTE リスクが高い。これらの患者には、薬物的予防を考慮する必要がある。

エビデンスレベル: Limited

投票結果: 賛成 94.83%、反対 1.72%、棄権 3.45% (強いコンセンサス)

## CQ5: 両側同時 THA (SBTHA) を受ける患者に最適な予防薬は何か?

著者: Graham S. Goh, Leanne Ludwick, Yoshi P. Djaja 翻訳者: 眞島任史

推奨: SBTHA を受ける患者は、片側 THA を受ける患者と比較して、VTE リスクが高い。これらの患者には薬物的予防を考慮する必要があるが、最適な薬剤は不明である。

エビデンスレベル: Limited

投票結果: 賛成 94.07%、反対 1.69%、棄権 4.24% (強いコンセンサス)

## CQ6: TKA / THA 患者に使用される VTE 予防薬のうち出血の発生率が最も高いものは何か?

著者: Enrique Gómez-Barrena, Per Kjærsgaard Andersen 翻訳者: 山本祐司

推奨: 血栓予防が行われた THA / TKA 患者では、出血のリスクが高くなる。出血の発生率は、アスピリンより低分子量ヘパリン (LMWH) で高く、LMWH およびその他の新規経口抗凝固薬 (NOAC) よりリバロキサバンで高い。また、NOAC の中でもアピキサバンが最も出血の発生率が低いと報告されている。ただし、出血リスクは薬剤の投与量や患者背景 (年齢、腎機能障害)、標準治療の変化 (特に昨今のトラネキサム酸 [TXA] の汎用) などの影響を受けるため、データの複雑化が否めない。

エビデンスレベル: Limited

投票結果: 賛成 95.73%、反対 1.71%、棄権 2.56% (強いコンセンサス)

**CQ7: TJA 患者において VTE の薬物的予防に伴う血腫による再入院および再手術の発生率は？**

著者: Ayesha Abdeen, Maria Jurado, Jaime B. Mariño, Ernesto Guerra-Farfán 翻訳者: 山本祐司

**推奨:** TJA 患者における VTE 薬物的予防に伴う血腫による再入院および再手術の発生率は低く、抗凝固薬の選択との明確な関連はない。ワルファリンまたは第 Xa 因子阻害薬と比較して、エノキサパリンを使用している患者では、再手術を必要とする血腫の発生率が高くなる傾向がある。30 日以内の再入院率は、アスピリンと比較した場合、すべての予防薬（低分子量ヘパリン [LMWH]、直接阻害型経口抗凝固薬 [DOAC]、ワルファリン）で高くなっている。ただし、これらのより強力な薬剤はリスク層別化で高リスクに該当する患者（複数の併存疾患など）への使用が最適とされているため、既存の研究データでは交絡因子の影響が排除されていない。リスク層別化は、米国整形外科学会 (AAOS) および米国胸部医師会 (ACCP) のガイドラインや、本誌 General セクション質問 24 への回答に記載された詳細情報により行うことができる。

エビデンスレベル: Limited

投票結果: 賛成 93.16%、反対 3.42%、棄権 3.42% (強いコンセンサス)

**CQ8: 整形外科手術を受ける患者において、VTE 予防薬の種類は術後の手術部位感染 (SSI) リスクに影響を与えるか？**

著者: Francisco Bengoa, Luiz S. Marcelino Gomes, Óliver Marin-Peña, William V. de Paula Ferreira, Juan José Pellegrini, Agustín Vial 翻訳者: 山本祐司

**推奨:** VTE 予防薬としてのワルファリンの使用は、特に TJA を受ける患者において、SSI や PJI の発生率を有意に高める。限られたエビデンスではあるが、アスピリンを予防薬として使用した場合の SSI 発生率は、より強力な抗凝固薬と比較して低いか同等であることが示されている。

エビデンスレベル: Limited

投票結果: 賛成 93.91%、反対 2.61%、棄権 3.48% (強いコンセンサス)

**CQ9: 人工関節置換術を受ける患者において、VTE 予防薬の種類は術後 PJI のリスクに影響を与えるか？**

著者: Marjan Wouthuyzen-Bakker, Krešimir Crnogača, Marc W. Nijhof 翻訳者: 山本祐司

**推奨:** VTE 予防薬の種類は術後 PJI のリスクに影響を与える。アセチルサリチル酸（アスピリン）と比較した場合、ビタミン K 拮抗薬 (VKA) に最も強い関連性が示される。

エビデンスレベル: Moderate

投票結果: 賛成 91.30%、反対 5.22%、棄権 3.48% (強いコンセンサス)

**CQ10: 感染のため再置換術を受ける患者において、VTE 予防薬は変更すべきか？**

著者: Karan Goswami, P. Maxwell Courtney, Ran Schwarzkopf, Mohammad N. Al Mutani, Stephen Silva, Gwo-Chin Lee 翻訳者: 山本祐司

**推奨:** 感染が VTE リスクを高めることは知られているが、この患者群に対するアプローチの変更を支持するエビデンスはない。一般的に、アスピリンは再置換術において安全かつ有効である。ただし、米国整形外科学会 (AAOS) および米国胸部医師会 (ACCP) のガイドラインや、本誌 General セクション質問 24 の回答に基づきリスク層別化を行った結果、高リスク群に分類される患者においては、より強力な抗凝固薬の使用を検討すべきである。

エビデンスレベル: Limited

投票結果: 賛成 94.83%、反対 2.59%、棄権 2.59% (強いコンセンサス)

**CQ11: THA / TKA の PJI 治療を目的とした二期的再置換術または切除関節形成術において、術後の最適な VTE 予防策とは何か？**

著者: Kenneth L. Urish, Mark J. Spangehl, William M. Mihalko 翻訳者: 鉄永智紀

**推奨:** THA / TKA の PJI に対する二期的再置換術または根治的切除関節形成術においてコンポーネントを抜去もしくは再置換する場合、術後 VTE 発症リスクや、それに対する抗凝固治療に伴う合併症のリスクに基づき、患者を層別化すべきである。抗凝固療法に関しては、初回 THA および TKA のガイドラインに基づいて選択する。

エビデンスレベル: Moderate

投票結果: 賛成 93.97%、反対 2.59%、棄権 3.45% (強いコンセンサス)

**CQ12: VTE のリスクが高い患者では、下肢ターニケットの使用を避けるべきか？**

著者: Charles P. Hannon, Nicolaas C. Budhiparama, Matthew P. Abdel 翻訳者: 鉄永智紀

推奨: 下肢ターニケットは、術後の VTE のリスク増加に寄与する可能性があり、VTE リスクが高い患者には注意して使用する必要がある。

エビデンスレベル: Moderate

投票結果: 賛成 91.30%、反対 7.83%、棄権 0.87% (強いコンセンサス)

**CQ13: THA / TKA における早期離床の傾向が見られるなか、空気圧迫装置 (PCD) が果たす役割はあるか？**

著者: Muhammad S. Amin, Mohsin Javid, Plamen Kinov, William A. Jiranek 翻訳者: 鉄永智紀

推奨: PCD は、薬物的予防と併用した場合、THA / TKA 後の VTE に対して効果的な予防法とされてきた。しかし、昨今の早期に離床する THA / TKA において、PCD の使用を支持する明確なエビデンスはない。

エビデンスレベル: Limited

投票結果: 賛成 83.76%、反対 13.68%、棄権 2.56% (強いコンセンサス)

**CQ14: THA または TKA を受ける患者において、ルーチンの機械的圧迫装置 (MCD) の使用は必要か？**

著者: Zhongming Chen, Daniel J. Berry, Mojib M. Manzary, Michael A. Mont 翻訳者: 鉄永智紀

推奨: THA または TKA を受ける患者では、VTE の予防として MCD のルーチンでの使用を行っても良い。

エビデンスレベル: High

投票結果: 賛成 92.37%、反対 7.36%、棄権 0.00% (強いコンセンサス)

**CQ15: VTE 予防のためにアスピリンを投与されている患者において、空気圧迫装置 (PCD) をルーチンで併用する必要はあるか？**

著者: Ariel E. Saldaña, Ronald J. Pérez 翻訳者: 鉄永智紀

推奨: TJA 後の VTE 予防には、アスピリンと PCD の併用が、アスピリン単独よりも効果的である可能性がある。

エビデンスレベル: Moderate

投票結果: 賛成 82.76%、反対 12.93%、棄権 4.31% (強いコンセンサス)

**CQ16: CPM (continuous passive motion) 装置の使用は、膝関節手術後の VTE リスクを軽減させるか？**

著者: Charlotte Brookes, Caroline B. Hing, William Roberts, Nelson E. Socorro, Andres Silberman 翻訳者: 古松毅之

推奨: CPM が膝関節術後の VTE リスクを下げるという決定的なエビデンスはない。3 件の研究では CPM を使用しても膝関節術後 VTE リスクに変化は見られず (エビデンスレベル: 中)、5 件の研究ではリスク軽減の可能性が示唆されている (エビデンスレベル: 低)。

エビデンスレベル: Limited

投票結果: 賛成 95.69%、反対 3.45%、棄権 0.86% (強いコンセンサス)

**CQ17: 早期離床など ERAS (Enhanced Recovery After Surgery) のコンセプトは、初回 THA や TKA 後の VTE リスクを軽減させるか？**

著者: William G. Fishley, Mihovil Plečko, Rasmus T. Mikkelsen, Ivan Boháček, Per Kjærsgaard Andersen, Óliver Marín-Peña, Mike Reed 翻訳者: 古松毅之

推奨: 早期離床など ERAS のコンセプトは、初回 THA や TKA 後の VTE リスクを軽減させる可能性が高い。しかし、本件を考察したエビデンスレベルの高い研究は存在しない。

エビデンスレベル: Limited

投票結果: 賛成 96.58%、反対 1.71%、棄権 1.71% (強いコンセンサス)

**CQ18: 待機的骨盤・大腿骨骨切り術を受ける患者においてルーチンの VTE 予防策は必要か？**

著者: Oguzhan Korkmaz, Yutaka Inaba, Taro Tezuka, Ibrahim Azboy 翻訳者: 手塚太郎

**推奨:** 待機的骨盤・大腿骨骨切り術を受ける患者における VTE の発生率の低さや、これまでの文献におけるエビデンスの欠如を考慮し、このような患者群に対してはアスピリンの投与や理学的予防を推奨する。ただし、VTE リスクの高い患者に対しては、より強力な薬物的予防法を実施すべきである。

エビデンスレベル: Limited

投票結果: 賛成 86.32%、反対 10.26%、棄権 3.42% (強いコンセンサス)

**CQ19: 下肢ドップラーエコーを用いた DVT 検査が適応となる症例とは？**

著者: Geno J. Merli, Michael Tanzer, Nicola Gallagher, David E. Beverland 翻訳者: 古松毅之

**推奨:** 特定のガイドラインを示した文献が存在しないため、われわれは次のように推奨する。下肢手術後 6 週間以内の患者において、以下の項目に該当する場合は、ドップラーエコー検査を依頼すべきである。

- ベッド上での拳上や一晩の安静によっても改善しない下肢の腫脹がある
- 一晩の安静仰臥をもってしても悪化する足の腫脹がある
- 活動性がなおよび／または VTE の既往など DVT ハイリスク群の患者である

エビデンスレベル: Limited

投票結果: 賛成 89.57%、反対 6.09%、棄権 4.35% (強いコンセンサス)

**CQ20: 下肢に遠位 DVT を認める場合、エコーによる近位静脈の画像検査を繰り返し行うべきか？**

著者: Noam Shohat, Gregg R. Klein, William J. Hozack 翻訳者: 古松毅之

**推奨:** 現存の文献や公的機関の推奨によれば、初回のエコー検査で近位部に DVT を認めなかった孤立性の遠位 DVT 患者に対しては、抗凝固療法なしでの経過観察が可能である。ただし、1 週間後に近位静脈のエコー検査を行い、DVT が拡大していないかを確認する必要がある。特に、エコーによるフォローアップ検査が出来ないような状況においては、経験則に基づいて抗凝固療法を行うのが妥当である。

エビデンスレベル: Consensus

投票結果: 賛成 89.57%、反対 6.09%、棄権 4.35% (強いコンセンサス)

**CQ21: UKA (PF 置換を含む) の VTE リスクは TKA よりも低いのか？**

著者: Tad Gerlinger, Ivan Bohacek, David G. Campbell 翻訳者: 古松毅之

**推奨:** UKA、TKA とともに症候性 VTE の頻度は低い。UKA 症例における DVT の頻度は最大 1.6% で、PE の頻度は最大 0.13% である。ほとんどの研究において UKA 後の VTE リスクは TKA と比較して低い傾向を認めるが、検定力不足である。検定力を満たしたのはレジストリ研究のみで、VTE のリスク比は 0.39 (0.27 - 0.57) であった。PF 置換の VTE リスクに関してはデータが不足している。

エビデンスレベル: Moderate

投票結果: 賛成 96.49%、反対 0.88%、棄権 2.63% (強いコンセンサス)

## QUESTION 1: Is VTE after elective total joint arthroplasty a "never event"?

**RECOMMENDATION:** Venous thromboembolism (VTE) after elective total joint arthroplasty (TJA) continues to occur despite various strategies in prophylaxis and should not be considered a "never event."

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## QUESTION 2: Is there a difference in VTE risk profile for patients undergoing total hip arthroplasty or total knee arthroplasty?

**RECOMMENDATION:** Patients undergoing total knee arthroplasty (TKA) have a higher venous thromboembolism (VTE) risk than total hips arthroplasty (THA) patients. In addition, VTE tends to present earlier in TKA patients. There is no evidence for different risk profiles among patients undergoing THA or TKA. Also, there is no clarity on whether it is necessary to stratify TKA differently than THA patients, or how to do it.

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## QUESTION 3: What is the most optimal VTE prophylaxis following TKA/THA?

**RECOMMENDATION:** Low-dose aspirin (ASA) is currently the most effective and safest method of prophylaxis against venous thromboembolism (VTE) in patients undergoing total joint arthroplasty (TJA). We recommend the use of low-dose ASA as the primary method of VTE prophylaxis in all patients undergoing TJA, including moderate-to high-risk patients.

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## QUESTION 4: What is the chemoprophylactic agent of choice for patients undergoing simultaneous bilateral total knee arthroplasty (SBTKA)?

**RECOMMENDATION:** Patients undergoing SBTKA are at a higher risk of venous thromboembolism (VTE) compared to those undergoing unilateral total knee arthroplasty (TKA). Chemical prophylaxis should be considered for these patients.

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## QUESTION 5: What is the chemoprophylactic agent of choice for patients undergoing simultaneous bilateral total hip arthroplasty (SBTHA)?

**RECOMMENDATION:** Patients undergoing SBTHA are at a higher risk of venous thromboembolism (VTE) compared to those undergoing unilateral total hip arthroplasty (THA). Chemoprophylaxis should be considered for these patients, although the optimal agent remains uncertain.

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## QUESTION 6: Which VTE prophylactic agent used in patients undergoing TKA/THA has the highest bleeding rate?

**RECOMMENDATION:** Patients undergoing total hip arthroplasty/total knee arthroplasty (THA/TKA) who received thromboprophylaxis are at an increased risk of bleeding. Higher bleeding rates were detected for low-molecular-weight heparin (LMWH) versus aspirin (ASA) and for rivaroxaban versus LMWH and other novel oral anticoagulants (NOAC), while the lowest bleeding rates in patients receiving NOAC were observed for apixaban. Drug dosage and patient characteristics (age, renal dysfunction) may complicate the data on bleeding risk as may changes in clinical practice (particularly with the wide use of tranexamic acid (TXA) currently).

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## QUESTION 7: What is the incidence of readmission and re-operation for hematomas secondary to administration of chemoprophylaxis for VTE in patients undergoing total joint arthroplasty?

**RECOMMENDATION:** The incidence of readmission and re-operation for hematomas secondary to chemoprophylaxis for venous thromboembolism (VTE) in patients undergoing total joint arthroplasty (TJA) is low and not definitively related to the choice of anti-coagulant. There is a trend toward increased incidence of hematomas requiring re-operation in patients on enoxaparin in comparison to warfarin or factor Xa inhibitors. Thirty-day readmission rates are higher for all chemotherapeutic agents (low-molecular-weight heparin [LMWH], direct-oral anticoagulant [DOAC], warfarin), in comparison to aspirin (ASA). However, risk stratification practices resulting in higher risk patients who have complex co-morbidities preferably receiving these more potent agents have not been eliminated as a confounding variable in existing studies. Risk stratification can be done as per the American Academy of Orthopaedic Surgeons (AAOS) and the American College of Chest Physicians (ACCP) guidelines and by further information found in the response to question # 24 of the 2021 International Consensus Meeting (ICM) on VTE - General section.

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## QUESTION 8: Does the type of VTE prophylaxis influence the risk of subsequent surgical site infection (SSI) in patients undergoing orthopaedic procedures?

**RECOMMENDATION:** The use of warfarin is associated with significantly higher surgical site infection (SSI) and periprosthetic infection (PJI) rates when used for venous thromboembolism (VTE) prophylaxis, especially in patients undergoing total joint arthroplasty (TJA). Limited evidence points to lower or similar rates of SSI using aspirin (ASA) as prophylaxis compared to more potent anticoagulants.

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## QUESTION 9: Does the type of VTE prophylaxis influence the risk of subsequent periprosthetic joint infection in patients undergoing joint arthroplasty?

**RECOMMENDATION:** Yes, the type of venous thromboembolism (VTE) prophylaxis influences the risk of subsequent periprosthetic joint infection (PJI). The strongest association is observed for vitamin-K antagonists (VKA) when compared to acetylsalicylic acid (Aspirin [ASA]).

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## QUESTION 10: Should the method for VTE prophylaxis be altered in patients undergoing revision for infection?

**RECOMMENDATION:** Although infection is known to increase the risk of venous thromboembolism (VTE), there is no evidence to support a change in the approach to this group of patients. In general, aspirin (ASA) is safe and effective in revision surgery. Nevertheless, more potent anticoagulation strategies should be considered in the high-risk cases after risk stratification as determined by the American Academy of Orthopaedic Surgeons (AAOS) and the American College of Chest Physicians (ACCP) guidelines and by further information found in the response to question # 24 of the 2021 International Consensus Meeting (ICM) on VTE - General section.

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**QUESTION 11: What is the optimal choice for VTE prophylaxis following two-stage or resection arthroplasty for treatment of knee and hip periprosthetic joint infection?**

**RECOMMENDATION:** Following explantation or reimplantation of components as part of a two-stage procedure or definitive resection arthroplasty for a hip or knee periprosthetic joint infection (PJI), patients should be stratified based on the risk of venous thromboembolism (VTE) events versus risk of post-operative complications associated with anticoagulation. Anticoagulation can be selected from established guidelines for primary total hip arthroplasty (THA) and total knee arthroplasty (TKA).

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**QUESTION 12: Should the use of lower extremity tourniquet be avoided in patients at a high risk of VTE?**

**RECOMMENDATION:** Lower extremity tourniquets may be associated with an increased risk of venous thromboembolism (VTE) post-operatively and should be used with caution in patients at a high risk of VTE.

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## QUESTION 13: Considering the trend to ambulatory hip and knee arthroplasty, is there a role for the use of pneumatic compression devices?

**RECOMMENDATION:** Pneumatic compression devices have been demonstrated to be effective prophylaxis against venous thromboembolism (VTE) following hip/knee arthroplasty when used concurrently with chemoprophylaxis. However, their use in present-day ambulatory hip/knee arthroplasty is not clearly supported in current literature.

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## QUESTION 14: Should mechanical compressive devices be used routinely in patients undergoing total hip arthroplasty or total knee arthroplasty?

**RECOMMENDATION:** Mechanical compressive devices can be used routinely in patients undergoing total hip arthroplasty (THA) or total knee arthroplasty (TKA) as venous thromboembolism (VTE) prophylaxis.

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## QUESTION 15: Should pneumatic compression devices (PCD) routinely be co-administered to patients receiving aspirin for VTE prophylaxis?

**RECOMMENDATION:** It appears that coadministration of aspirin (ASA) with pneumatic compression devices (PCD) may be more effective than ASA alone in prevention of venous thromboembolism (VTE) following total joint arthroplasty (TJA).

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## QUESTION 16: Does the use of Continuous Passive Machine (CPM) reduce the risk of VTE following knee surgery?

**RECOMMENDATION:** There is no conclusive evidence that continuous passive machine (CPM) reduces the risk of venous thromboembolism (VTE) following knee surgery. Three moderate quality studies demonstrate no difference in the risk of VTE in knee surgery with the use of continuous passive motion, with five low quality studies showing a potential reduced risk of VTE.

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## QUESTION 17: Does the "enhanced recovery" concept, which includes early ambulation, reduce the risk of VTE in patients undergoing primary total hip or knee arthroplasty?

**RECOMMENDATION:** The "enhanced recovery" concept including early mobilization is likely to reduce the risk of venous thromboembolism (VTE) in patients undergoing primary total hip arthroplasty (THA) or total knee arthroplasty (TKA). However, the literature lacks studies with a high level of evidence considering this topic.

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## QUESTION 18: Do patients undergoing elective pelvic and/or femoral osteotomy require routine VTE prophylaxis?

**RECOMMENDATION:** Given the low rate of venous thromboembolism (VTE) in patients undergoing elective pelvic and/or femoral osteotomy, as well as the absence of robust data in current literature, this workgroup recommends that aspirin (ASA) and/or mechanical prophylaxis should be used as VTE prophylaxis in this patient population. Only patients at a high risk of VTE should be given more potent or additional chemoprophylaxis.

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## QUESTION 19: What are the indications for Doppler ultrasound of the lower extremity to confirm or rule out DVT?

**RECOMMENDATION:** In the absence of any specific guidance from the literature we would propose that in any patient who is within 6 weeks following a lower limb surgery that a Doppler scan should be requested when:

- There is lower limb swelling that does not respond to elevation or after a night's rest in bed.
- The lower extremity swelling worsens after a night spent recumbent.
- There is a high index of suspicion for deep venous thrombosis (DVT) in patients with active cancer and/or history of prior venous thromboembolism (VTE).

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## QUESTION 20: Should the presence of a distal DVT in an extremity mandate repeat imaging of proximal veins?

**RECOMMENDATION:** Based on current literature and recommendations from official bodies, patients with an isolated distal deep venous thrombosis (DVT) (in whom a proximal component was not detected at the initial scan) can be managed without anticoagulation but need to have a follow up ultrasound (US) of the proximal veins after 1 week to rule out DVT extension. It is reasonable to treat the patient empirically with anticoagulation, especially in situations where a follow-up ultrasound may not be possible.

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## QUESTION 21: Do patients undergoing UKA, including patellofemoral joint arthroplasty, have a different VTE risk profile compared to TKA?

**RECOMMENDATION:** The incidence of symptomatic venous thromboembolism (VTE) is low in both unicompartmental knee arthroplasty (UKA) and total knee arthroplasty (TKA) patients, deep venous thrombosis (DVT) and pulmonary embolism (PE) occur in up to 1.6% and 0.13% of UKA patients. Most studies had a trend of decreased VTE risk following UKA compared to TKA but were underpowered, only registry studies were sufficiently powered and showed a VTE risk ratio (RR) of 0.39 (0.27 - 0.57). There is a paucity of data on patellofemoral joint arthroplasty (PFJA) and VTE risk.

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PART V

# Oncology

<監訳者>

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**CQ 1 : 骨転移における VTE**

- A . この患者群における VTE の一般的リスクや、リスクを増加させる因子とは何か？  
 B . 出血リスクも考慮した場合、この患者群における最適な VTE 予防プロトコルとは何か？

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**推奨 :** 骨転移による予防的内固定術や病的骨折に内固定術を受ける患者では、VTE を発症するリスクが高くなる。リスク因子には年齢や併存疾患などの患者特性や、手術の範囲、手術時間などが含まれる。手術を受ける患者や入院患者に禁忌が無ければ、理学的予防の有無に関わらず血栓予防薬の投与が必要である。現時点では、どの血栓予防薬を使用すべきか具体的に推奨するに足る十分なエビデンスはない。

エビデンスレベル : Limited

投票結果 : 賛成 92.31%、反対 0.00%、棄権 7.69% (強いコンセンサス)

**CQ 2 : 原発性骨腫瘍・肉腫患者**

- A . この患者群における VTE の一般的リスクや、リスクを増加させる因子とは何か？  
 B . 出血リスクも考慮した場合、この患者群における最適な VTE 予防プロトコルとは何か？

著者 : Tanis Worthy, Michelle Ghert, Mohammad H. Basuki, Felasfa Wodajo, Andreas Leithner, Panayiotis J. Papagelopoulos, Jashvant Poeran 翻訳者 : 中田英二

**推奨 :** 肉腫の手術を受ける患者は、その患者集団、術式、合併症など複数の共通因子により、VTE リスクが高くなる。患者の出血リスクが非常に高くない限り、低分子量ヘパリン (LMWH) またはアスピリンによる薬物的予防を空気圧迫法と併用して行う必要がある。

エビデンスレベル : Limited

投票結果 : 賛成 92.31%、反対 7.69%、棄権 0.00% (強いコンセンサス)

**CQ 3 : ルーチンの VTE 予防が必要な腫瘍関連の整形外科手術とは何か？**

著者 : Shang-Wen Tsai, Te-Feng Arthur Chou, Wei-Ming Chen 翻訳者 : 中田英二

**推奨 :** 骨転移の切除術や人工関節を用いた再建術を受ける患者は VTE リスクが高まるため、ルーチンでの予防が必要である。

エビデンスレベル : Limited

投票結果 : 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

**CQ 4 : 悪性腫瘍の既往があるか、あるいは悪性腫瘍を併発している患者の病的骨折の手術や整形外科手術に対し、VTE 予防プロトコルをどのように調整する必要があるか？**

著者 : Jashvant Poeran, Panayiotis J. Papagelopoulos, Tanis Worthy, Michelle Ghert, Mohammad H. Basuki, Felasfa Wodajo, Andreas Leithner 翻訳者 : 中田英二

**推奨 :** 悪性腫瘍の既往があるか、あるいは悪性腫瘍を併発している患者が病的骨折の手術や整形外科手術を受ける場合、VTE 発症リスクが高くなる。各種ガイドラインは薬剤の選択と投与期間に関してある程度の手引きとなり得るが、特に、原発腫瘍の部位など、このハイリスク群の VTE リスクを増大させ得る要因を踏まえると、最適な VTE 予防策を決定するには現在のエビデンスは不十分である。

エビデンスレベル : Limited

投票結果 : 賛成 92.86%、反対 7.14%、棄権 0.00% (強いコンセンサス)

## QUESTION 1: VTE in Bone Metastasis

A. What is the overall risk for VTE in this patient population and what are the factors that increase VTE risk in this patient population?

B. What is the optimal VTE prophylaxis protocol in this patient population when also taking into consideration bleeding risk?

**RECOMMENDATION:** Patients that undergo prophylactic fixation or pathological fracture fixation due to metastatic bone disease have a high risk of developing venous thromboembolism (VTE). Risk factors include patient characteristics such as age and comorbidities, as well as extent of surgery and duration of surgery. In the absence of contraindications, patients that undergo surgery or hospitalized patients should be administered thromboprophylaxis with or without mechanical prophylaxis. At this time, we do not have sufficient evidence to make specific recommendations for the type of thromboprophylaxis.

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## QUESTION 2: For Primary Bone Tumours/Sarcoma Patients

A. What is the overall risk for VTE in this patient population and what are the factors that increase VTE risk in this patient population?

B. What is the optimal VTE prophylaxis protocol in this patient population when also taking into consideration bleeding risk?

**RECOMMENDATION:** Patients undergoing sarcoma surgery have a high risk of venous thromboembolism (VTE) with multiple common risk factors relating to the patient population, surgery, and complications. Patients should have chemoprophylaxis with either low-molecular-weight heparin (LMWH) or aspirin (ASA) unless very high bleeding risk, combined with pneumatic compression.

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## QUESTION 3: What orthopedic tumor-related surgeries require routine prophylaxis?

**RECOMMENDATION:** Patients undergoing resection procedures for bone metastasis or procedures that involve prosthesis reconstruction are at higher risk of venous thromboembolism and require routine prophylaxis.

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## QUESTION 4: How should VTE prophylaxis protocols be adjusted for surgical repairs of pathological fractures or orthopaedic surgery in a patient with a history of malignancy or concurrent malignancy?

**RECOMMENDATION:** Patients undergoing surgical repairs of pathological fractures or those undergoing orthopaedic surgery with a history of malignancy or concurrent malignancy are at high risk for development of venous thromboembolism (VTE). While guidelines may provide some guidance in terms of choice of chemical agent and duration, the current evidence base is insufficient in determining optimal prophylaxis strategies, especially in light of factors that may further impact VTE risk in this high-risk population such as primary tumor site.

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PART VI

# Pediatric

<監訳者>

池 裕之、稲葉 裕



**CQ 1 : 整形外科手術後の VTE 危険因子は、小児と成人で異なるか？**

著者 : Graham S. Goh, John J. Corvi, Robert F. Murphy 翻訳者 : 崔賢民

**推奨 :** 小児整形外科患者における VTE の危険因子の多くは、成人と類似している。例えば、高齢 (青年期)、外傷、悪性腫瘍、特定の感染症、凝固障害、および VTE の既往歴または家族歴が挙げられる。しかし、成人に関する文献で報告されている特定の VTE 危険因子 (例 : 喫煙) は、小児ではあまり一般的でないものがあり、また、その逆もある (例 : 先天性血栓症)。

エビデンスレベル : Moderate

投票結果 : 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

**CQ 2 : 整形外科手術を受ける小児患者に特化した VTE リスク層別化法はあるか？**

著者 : Frederick Mun, Arjun Gupta, Manjeera S.B. Rednam, Ashok N. Johari, Amit Jain 翻訳者 : 崔賢民

**推奨 :** 整形外科手術を受ける小児患者における VTE の危険因子として、青年期、中心静脈カテーテル (CVC) の留置、肥満、外傷、経口避妊薬の使用が最も多く報告されている。現在のところ、これらの要因を網羅できるほど十分に開発された標準的なツールはない。小児集団における VTE の発生率は低いため、簡単なスクリーニング質問を用いることで特定可能な高リスク者を除き、VTE 薬物的予防をルーチンに使用すべきではない。

エビデンスレベル : Moderate

投票結果 : 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

**CQ 3 : 整形外科手術を受ける小児患者において、骨格の成熟度と性別は VTE 予防策の選択に影響を与えるか？**

著者 : Enric Castellet, Miriam Basagaña-Farrés 翻訳者 : 崔賢民

**推奨 :** 性別は VTE 予防策の選択に影響を与えない。しかし、ハイリスクの小児患者 (13 歳以上) には、VTE 予防策の施行が有効となる場合がある。

エビデンスレベル : Strong

投票結果 : 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

**CQ 4 : 慢性的な神経筋疾患のある小児にルーチンの VTE 予防は必要か？**

著者 : Benjamin J. Shore, Syeda Mehwish, Muhammad A. Chinoy 翻訳者 : 崔賢民

**推奨 :** 慢性的な神経筋疾患のある小児における VTE リスクは、全体的に非常に低い。慢性神経筋疾患患児に対するルーチンの VTE 予防は、その他の VTE 危険因子が確認されない限り必要ない。

エビデンスレベル : Moderate

投票結果 : 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

**CQ 5 : 下肢ギプス固定により治療中の小児患者にルーチンの VTE 予防を行う必要はあるか？**

著者 : Manjeera S.B. Rednam, Ashok N. Johari, Sanjeev Sabharwal 翻訳者 : 秋山豪介

**推奨 :** 小児患者のギプス固定では、年齢が若いこと自体が DVT に対する予防となり得るため、ルーチンの VTE 予防は推奨されない。成人とは異なり、小児では下肢のギプス固定と DVT リスクの関連性は確立されておらず、小児では急性期 DVT の発症はまれであるため、ルーチンの VTE 予防は推奨されない。ただし、VTE 発症の危険因子が 3 つ以上ある小児に対する明確な推奨も確立されていない。

エビデンスレベル : Weak

投票結果 : 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

**CQ 6 : 整形外科手術を受ける健常な小児患者における VTE 予防策は、早期離床および間欠的空気圧迫装置 (IPCD) で十分か？**

著者 : Robert F. Murphy, Chadi Tannoury 翻訳者 : 秋山豪介

**推奨 :** 整形外科手術を受ける健常な小児および青年患者における VTE 発生はまれである。従って、VTE の予防には、早期の離床および IPCD で十分である。しかし、重症外傷の手術や、長時間の固定が必要となる大規模な再建手術を受けた小児患者には、クリティカルケアが必要である。また、他の VTE リスク因子を有する場合、薬物による予防を検討すべきである。

エビデンスレベル : Moderate

投票結果 : 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

## CQ7: VTE リスクに関して、小児整形外科手術の中でどのような手術が高リスク・低リスクと分類されるか？

著者: Benjamin J. Shore, Samir Sabharwal, Sanjeev Sabharwal 翻訳者: 秋山豪介

**推奨:** 整形外科手術を受ける小児患者において VTE リスクは一般的に低い。しかし、重症骨軟部組織感染症 (Panton-Valentine Leukocidin (PVL) 遺伝子を有する MRSA 感染症) に対する手術を行う場合は VTE のリスクが高くなる。加えて、股関節・脊椎・スポーツ分野の手術は VTE の危険因子として認識されている。さらに、小児整形外科手術後の VTE リスクは、青年期で最も高まるとされる。その他に、凝固障害 (家族性血栓症など) や中心静脈カテーテル (CVC) の留置がある場合、特定の整形外科手術よりも VTE リスクを大幅に増加させることが明らかとなった。結論として、交絡した VTE 危険因子が特定可能な小児及び青年患者においては、周術期の VTE スクリーニング・ツールおよびリスク層別化モデルの活用が非常に有益である。

**エビデンスレベル:** Moderate

**投票結果:** 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

## CQ8: ルーチンの VTE 予防薬の投与が必要な小児科手術は何か？

著者: Cecilia A. Méndez, Juan M. Del Castillo, Eduardo I. Vilensky, Muhammad A. Chinoy, Syeda Mehwish 翻訳者: 秋山豪介

**推奨:** VTE の危険因子がない場合、整形外科手術を受ける 13 歳未満の患者には、ルーチンの薬物的予防をすべきではない。

**エビデンスレベル:** Weak

**投票結果:** 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

## QUESTION 1: Are the risk factors for VTE following orthopaedic procedures different between children and adults?

**RECOMMENDATION:** Many risk factors for venous thromboembolism (VTE) in pediatric orthopaedic patients are similar to those in adults. These include older age (adolescents), trauma, malignancy, certain infections, clotting disorders and a personal or family history of VTE. However, certain VTE risk factors reported in adult literature (e.g., smoking) may be less prevalent in children, and vice versa (e.g., congenital thrombophilia).

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## QUESTION 2: Are there specific risk stratification methods for VTE in pediatric patients undergoing orthopaedic procedures?

**RECOMMENDATION:** Adolescence, central venous catheter (CVC) placement, obesity, trauma, and oral contraceptive use are the most commonly reported risk factors for venous thromboembolism (VTE) in pediatric patients undergoing orthopaedic surgery. Currently, there are no standardized tools that are well-developed enough to capture all these factors. Due to the low incidence of VTE in the pediatric population, VTE chemoprophylaxis should not be routinely used except in high-risk individuals who can be identified with the use of simple screening questions.

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## QUESTION 3: In pediatric patients undergoing orthopaedic procedures, does skeletal maturity and gender influence the choice of VTE prophylaxis?

**RECOMMENDATION:** Gender does not influence the choice of venous thromboembolism (VTE) prophylaxis. However, high-risk pediatric patients  $\geq 13$ -years old, may benefit from the administration of VTE prophylaxis.

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## QUESTION 4: Is routine VTE prophylaxis necessary in children with chronic neuromuscular conditions?

**RECOMMENDATION:** The overall risk of venous thromboembolism (VTE) in children with chronic neuromuscular conditions is very low. Routine VTE prophylaxis in children with chronic neuromuscular conditions is not necessary, unless additional VTE risk factors are identified.

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## QUESTION 5: Do pediatric patients placed in a lower extremity cast immobilization require routine VTE prophylaxis?

**RECOMMENDATION:** Routine thromboprophylaxis is not recommended in pediatric patients with cast immobilization. Furthermore, young age is protective against deep venous thrombosis (DVT) in children. Unlike the adult population, the association between lower extremity cast immobilization and venous thromboembolism (VTE) risk has not been established in children. As development of acute DVT is unusual in children, routine prophylaxis is not recommended. However, there are also no clear recommendations for children with more than 3 risk factors for the development of VTE.

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## QUESTION 6: Is early ambulation and/or mechanical intermittent devices sufficient for VTE prophylaxis in otherwise healthy pediatric patients undergoing orthopaedic procedures?

**RECOMMENDATION:** Considering the rarity of venous thromboembolism (VTE) events in healthy pediatric and adolescent patients undergoing elective orthopaedic procedures, early ambulation and/or mechanical intermittent devices are sufficient for the prevention of VTE. However, pediatric orthopaedic patient undergoing surgery following major trauma, as well as patients undergoing major reconstruction resulting in prolonged immobilization, require critical care. Additionally, they exhibit other risk factors for VTE and prophylaxis with a supplementary pharmacologic agent should be considered.

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## QUESTION 7: Concerning VTE risk, which surgeries can be considered major, and which surgeries can be considered non-major in pediatric orthopaedics?

**RECOMMENDATION:** The overall risk of venous thromboembolism (VTE) in pediatric patients undergoing orthopaedic surgery is low. Pediatric orthopaedic patients undergoing surgery for the management of certain severe musculoskeletal infections (Methicillin-resistant *Staphylococcus aureus* [MRSA] with Panton-Valentine Leukocidin [PVL] +) are an increased risk of VTE. Additionally, hip, spine, and sports surgery have been identified as risk factors of VTE. Furthermore, the risk of VTE after pediatric orthopaedic surgery appears to be greatest in adolescents.

Moreover, coagulation disorders (such as familial thrombophilia), as well as the presence of indwelling central venous catheters (CVC), were found to increase VTE risk substantially more than any specific orthopaedic surgical procedure. In conclusion, adolescents with identifiable confounding VTE risk factors in this setting would benefit greatly from the utilization of perioperative VTE screening tools and risk stratification models.

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## QUESTION 8: What pediatric procedures require routine administration of VTE prophylaxis?

**RECOMMENDATION:** In the absence of other identifiable risk factors of venous thromboembolism (VTE), chemoprophylaxis for VTE should not be routinely prescribed in patients younger than thirteen undergoing orthopaedic procedures.

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PART VII

# Shoulder & Elbow

<監訳者>

池 裕之、稲葉 裕、大島 康史、眞島 任史



**CQ 1 : 肩および肘の手術のうち、VTE リスクの高い手術、低い手術はどのようなものがあるか？**

著者 : Alexander J. Rondon, Brian C. Werner, Surena Namdari 翻訳者 : 飯澤典茂

**推奨 :** 肩関節鏡下手術や骨折以外の肩人工関節置換術、すべての肘手術は VTE リスクが低いものと考えられる。肩の骨折関連の手術は重大な VTE リスクと考えられる。

エビデンスレベル : Limited

投票結果 : 賛成 93.94%、反対 6.06%、棄権 0.00% (強いコンセンサス)

**CQ 2 : 上肢の固定は VTE 予防のプロトコルに影響を与えるか？**

著者 : Richard L Donovan, Antoon van Raebroeckx, Michael R. Whitehouse 翻訳者 : 飯澤典茂

**推奨 :** 上肢の固定が VTE 予防のプロトコルに影響を及ぼすかを直接的に研究した報告はない。上肢固定の必要性に基づいた VTE 予防プロトコルの変更を支持するエビデンスは不十分である。

エビデンスレベル : Limited

投票結果 : 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

**CQ 3 : 上肢の VTE に関するリスク層別化法はあるか？**

著者 : Darren C. Roberts, David J. Warwick 翻訳者 : 飯澤典茂

**推奨 :** 手や手関節、肘の整形外科手術を除き、上肢に関する VTE の一般的なリスク層別化法はない。全ての患者について、状態や術式に基づくリスク因子を考慮するのが適切であると考えられる。局所または区域麻酔など強い鎮静剤を使用しない上肢の手術は、VTE リスクが非常に低いため、詳細なリスク評価を必要としない。

エビデンスレベル : Limited

投票結果 : 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

**CQ 4 : ギプス固定などの上肢固定を行う場合、ルーチンの VTE 予防を行うべきか？**

著者 : Kenneth A. Egol, Garret Esper, Ariana Meltzer-Bruhn 翻訳者 : 飯澤典茂

**推奨 :** 上肢固定をした患者にルーチンの VTE 予防を推奨する公式なガイドラインはないが、上肢の VTE リスクは存在している。様々な下肢または脊椎整形外科手術を受ける高リスクの患者に対する VTE 予防が推奨されていることから、上肢固定を受ける高リスクの患者にも VTE 予防は有益である可能性がある。しかし、エビデンスは決定的ではなく、さらなる研究が必要である。

エビデンスレベル : Limited

投票結果 : 賛成 90.91%、反対 9.09%、棄権 0.00% (強いコンセンサス)

**CQ 5 : 上肢の手術を受ける患者に対し、VTE 予防としてのアスピリン投与は有用か？**

著者 : Alberto D. Delgado-Martinez, Laura López-Cuquerella, Ryan M. Cox, Sommer Hammoud 翻訳者 : 飯澤典茂

**推奨 :** 上肢の手術における VTE 予防としてアスピリンの使用を支持または推奨するエビデンスは不十分である。より複雑な再建手術を受ける高リスクの患者には非常に有益であると思われる。

エビデンスレベル : Limited

投票結果 : 賛成 93.94%、反対 6.06%、棄権 0.00% (強いコンセンサス)

**CQ 6 : 上肢の骨接合術を受ける患者に対し、ルーチンの VTE 予防を行うべきか？**

著者 : Luis Becker, Juan M. DelCastillo, Matthias Pumberger, Nicolás Cancela 翻訳者 : 飯澤典茂

**推奨 :** 局所または区域麻酔で上肢骨接合術を受ける患者に対し、ルーチンの VTE 予防は必要ない。VTE リスクが高い患者、および 90 分以上の全身麻酔による手術を受ける患者には、VTE 予防を考慮する必要がある。

エビデンスレベル : Limited

投票結果 : 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

**CQ7: 人工肩関節置換術患者に対してルーチンの VTE 予防薬の投与は必要か？**

著者: Augustus C. Demanes, Ashley W. Blom, Setor K. Kunutsor, Kristen C.R. Combs, Ronald A. Navarro 翻訳者: 宮武和馬

**推奨:** 人工肩関節置換術後において、臨床的に重要な血栓塞栓症のリスクがわずかにしか増えないことを考えると、DVT 予防のメリットがリスクを上回るとは考えにくい。上肢手術における VTE 予防薬としてアスピリンの使用を支持する、あるいは推奨しないとするエビデンスはどちらも不十分である。VTE の潜在的リスクを有さない患者において、低分子量ヘパリン (LMWH) および直接阻害型経口抗凝固薬 (DOAC) に伴う出血リスクはメリットを上回る。

エビデンスレベル: Limited

投票結果: 賛成 96.97%、反対 3.03%、棄権 0.00% (強いコンセンサス)

**CQ8: 腱板修復術 (RCR) を受ける患者にルーチンの VTE 予防を行うべきか？**

著者: Brian C. Werner, Gerald R. Williams 翻訳者: 宮武和馬

**推奨:** 鏡視下 RCR 後の VTE 発生率は非常に低い。現在の文献では、鏡視下 RCR 後の VTE の危険因子がいくつか特定されているが、術後のルーチンの VTE 予防を有効とするエビデンスは限られている。推奨の指針となる文献が現存しないため、われわれの総意としては、RCR を受ける患者は術中の機械的圧迫と早期離床を行うべきであると推奨する。なお、患者はリスク層別化されるべきであり、他の病状のために VTE リスクが高いと考えられる場合は、薬物的予防の追加を考慮する必要がある。

エビデンスレベル: Limited

投票結果: 賛成 96.97%、反対 0.00%、棄権 3.03% (強いコンセンサス)

**CQ9: 関節鏡視下肩関節制動術を受ける患者にルーチンの VTE 予防を実施すべきか？**

著者: Ryan W. Paul, Anya T. Hall, Pawel Chodór, Jacek L. Kruczyński, Fotios P. Tjounmakaris 翻訳者: 宮武和馬

**推奨:** 現状、標準的なリスク患者が関節鏡視下肩関節制動術を受けるにあたり、ルーチンの血栓予防を推奨するデータは存在しない。合併症のリスクが低いことから、間欠的空気圧迫 (IPC) 装置の使用が推奨される。Latarjet/Bristow 手術による制動術を受ける患者では、VTE の薬物的予防を考慮する。

エビデンスレベル: Consensus

投票結果: 賛成 87.88%、反対 9.09%、棄権 3.03% (強いコンセンサス)

**CQ10: 肘関節形成術を受ける患者にルーチンの VTE 予防を実施すべきか？**

著者: Antoon van Raebroeckx, Surena Namdari 翻訳者: 宮武和馬

**推奨:** 肘関節形成術を受ける患者に対する VTE 予防の必要性に関して、強固なエビデンスに基づく推奨を導き出す適切なデータはない。少なくとも、断続的な空気圧迫 (IPC) と術後早期離床は、採用すべきリスクの低い介入である。

エビデンスレベル: Consensus

投票結果: 賛成 90.91%、反対 6.06%、棄権 3.03% (強いコンセンサス)

**CQ11: 肘関節周囲の靱帯再建を受ける患者に、ルーチンの VTE 予防を実施すべきか？**

著者: Filippo Randelli, Alberto Fioruzzi 翻訳者: 宮武和馬

**推奨:** 推奨の指針となる文献が現存しないため、われわれの総意としては、肘の不安定性のために靱帯再建を受ける患者は、術中の機械的圧迫と早期の離床を行うべきであると推奨する。なお、患者はリスク層別化されるべきであり、他の病状のために VTE リスクが高いと考えられる場合は、薬物的予防の追加を考慮する必要がある。

エビデンスレベル: Consensus

投票結果: 賛成 93.94%、反対 6.06%、棄権 0.00% (強いコンセンサス)

**CQ12: 上肢 DVT の典型的な徴候はあるか？**

著者: Ryan M. Cox, Jaimo Ahn, Surena Namdari 翻訳者: 宮武和馬

**推奨:** 上肢 DVT の徴候と症状のほとんどは、痛みや浮腫など、かなり非特異的である。ただし、目に見える静脈側副血行路や皮膚の変色などの異常は、DVT を疑う兆候である。

エビデンスレベル: Limited

投票結果: 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

## CQ13: 上肢 DVT の最適な管理法とは？

著者: Walter Ageno, Nelson E. Socorro 翻訳者: 宮武和馬

**推奨:** 上肢 DVT の患者は、下肢 DVT の患者に使用されるのと同じ抗凝固療法を受けるべきである。これらには、直接阻害型経口抗凝固薬 (DOAC) 単独 (アピキサバンおよびリバロキサバン)、低分子量ヘパリン (LMWH) および DOAC (エドキサバンおよびダビガトラン)、LMWH 単独、または LMWH およびビタミン K 拮抗薬が含まれる。抗凝固療法は、少なくとも 3 ヶ月間継続すべきである。DVT 発生の原因が不明なもの、あるいは永続的な危険因子 (がんなど) に続発するもので、出血リスクが低い場合は、3 ヶ月を超えて抗凝固療法を延長する必要がある。血栓溶解療法または外科的アプローチは、出血のリスクの低い、高度に選択された症例に限定すべきである。

**エビデンスレベル:** Limited

**投票結果:** 賛成 93.94%、反対 6.06%、棄権 0.00% (強いコンセンサス)

## QUESTION 1: Concerning VTE risk, which surgeries can be considered major, and which surgeries can be considered non-major in shoulder and elbow surgery?

**RECOMMENDATION:** Shoulder arthroscopy, nonfracture related shoulder arthroplasty, and all elbow procedures can be considered non-major venous thromboembolism (VTE) risk. Fracture related shoulder procedures can be considered major VTE risk.

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## QUESTION 2: Does immobilization of the upper extremity influence the VTE prophylaxis protocol?

**RECOMMENDATION:** No studies have directly answered the question of whether immobilization of the upper extremity influences the venous thromboembolism (VTE) prophylaxis protocol. There is insufficient evidence to support any alteration in VTE prophylaxis protocol based on need for immobilization of the upper extremity.

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## QUESTION 3: Is there a risk stratification method for VTE of the upper extremity?

**RECOMMENDATION:** No universal risk stratification for venous thromboembolism (VTE) exists with respect to the upper extremity except during hand, wrist, and elbow orthopaedic surgery. It is deemed appropriate that personal and procedural-based risk factors should be considered for all patients. Those upper limb operations under local or regional anesthetic without heavy sedation are at very low-risk for VTE and therefore detailed risk assessment is not indicated.

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## QUESTION 4: Should routine VTE prophylaxis be administered to patients undergoing upper extremity immobilization, such as casting?

**RECOMMENDATION:** While there are no official guidelines recommending routine venous thromboembolism (VTE) prophylaxis for patients undergoing upper extremity immobilization, the risk of upper extremity VTE is still present. Given that VTE prophylaxis for high-risk patients undergoing various lower limb or spinal orthopaedic procedures is recommended, VTE prophylaxis in high-risk patients undergoing upper extremity immobilization may be beneficial. However, evidence is inconclusive and further research must be done.

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## QUESTION 5: Is there a role for administration of aspirin as a VTE prophylaxis in patients undergoing upper limb surgery?

**RECOMMENDATION:** There is insufficient evidence to support or recommend against using aspirin as venous thromboembolism (VTE) prophylaxis in upper extremity surgery. It may be most beneficial for high-risk patients undergoing more complex reconstructive surgery.

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## QUESTION 6: Should routine VTE prophylaxis be administered to patients undergoing upper extremity osteosynthesis?

**RECOMMENDATION:** Routine venous thromboembolism (VTE) prophylaxis in patients undergoing upper extremity osteosynthesis under local or regional anesthesia is not needed. VTE prophylaxis should be considered in patients at high risk of VTE and those undergoing surgery under general anesthesia that lasts over 90 minutes.

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## QUESTION 7: Should routine chemical VTE prophylaxis be administered to patients undergoing shoulder arthroplasty?

**RECOMMENDATION:** Given the minimally increased risk of clinically significant thromboembolic events following shoulder arthroplasty, it is unlikely that the benefits of chemical deep venous thrombosis (DVT) prophylaxis outweigh the risks. There is insufficient evidence to support or recommend against using aspirin (ASA) as venous thromboembolism (VTE) prophylaxis in upper extremity surgery. The bleeding risks associated with low-molecular-weight heparin (LMWH) and direct oral anticoagulants (DOAC) outweigh the benefits in patients without substantial risk factors for VTE.

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## QUESTION 8: Should routine VTE prophylaxis be administered to patients undergoing rotator cuff repair?

**RECOMMENDATION:** The incidence of venous thromboembolism (VTE) after arthroscopic rotator cuff repair (RCR) is very low. Although the current literature has identified several risk factors for VTE after arthroscopic RCR, there is limited evidence supporting the efficacy of routine VTE prophylaxis postoperatively. In the absence of any literature to guide a recommendation, it is our consensus opinion that patients undergoing RCR should have intraoperative mechanical compression and early mobilization. Patients should also be risk-stratified and if considered high-risk due to other medical conditions, consideration should be given to add VTE chemoprophylaxis.

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## QUESTION 9: Should routine VTE prophylaxis be administered to patients undergoing arthroscopic stabilization procedures of the shoulder?

**RECOMMENDATION:** Currently, there is no data to suggest that routine thromboprophylaxis should be performed in patients undergoing arthroscopic shoulder stabilization in normative risk patients. Given the low risk of complications, intermittent pneumatic compression (IPC) devices should be used. Venous thromboembolism (VTE) pharmacological prophylaxis may be considered in patients undergoing stabilization surgery with the Latarjet/Bristow procedure.

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## QUESTION 10: Should routine VTE prophylaxis be administered to patients undergoing elbow arthroplasty?

**RECOMMENDATION:** There is no appropriate data to guide a strong evidence-based recommendation regarding the need for venous thromboembolism (VTE) prophylaxis for patients undergoing elbow arthroplasty (EA). At minimum, intermittent pneumatic compression (IPC) and early post-operative ambulation are low risk interventions that should be employed.

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## QUESTION 11: Should routine VTE prophylaxis be administered to patients undergoing ligament reconstruction around the elbow?

**RECOMMENDATION:** In the absence of any literature to guide a recommendation, it is our consensus opinion that patients undergoing ligament reconstruction for elbow instability should have intraoperative mechanical compression and early mobilization. Patients should also be risk-stratified and, if considered high-risk due to other medical conditions, consideration should be given to adding venous thromboembolism (VTE) chemoprophylaxis.

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## QUESTION 12: What are the classical signs, if any, of upper extremity DVT?

**RECOMMENDATION:** Most of the signs and symptoms of an upper extremity deep venous thrombosis (DVT) are rather non-specific, such as pain and edema. However, more unusual signs such as visible venous collaterals and skin discoloration are more concerning for DVT.

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## QUESTION 13: What is the optimal management of DVT of the upper extremity?

**RECOMMENDATION:** Patients with deep venous thrombosis (DVT) of the upper extremity should receive the same anticoagulant treatment regimens used for patients with DVT of the lower extremity. These include direct oral anticoagulants (DOAC) alone (apixaban and rivaroxaban), low-molecular-weight heparin (LMWH) and DOAC (edoxaban and dabigatran), LMWH alone, or LMWH and vitamin K antagonists. Anticoagulant treatment should be continued for at least 3 months and extended beyond 3 months if the event is unprovoked or secondary to permanent risk factors (e.g., cancer) and bleeding risk is low. The use of thrombolytic treatment or surgical approaches should be restricted to highly selected cases at low-risk for bleeding.

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PART VIII

# Sports

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<監訳者>

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## CQ 1 : スポーツ整形外科手術の中で、VTE リスクに関しどの手術が高リスクで、どの手術が低リスクな手術と考えられるか？

著者 : Martina Rama, Bryson R. Kemler, Sommer Hammoud 翻訳者 : 石橋恭之

**推奨 :** スポーツ整形外科手術における VTE の発生率は概して低く、そのリスクは安静 (固定) と免荷により増加する。このため上肢手術は、歩行や固定への影響が少ないことから、VTE リスクは低いと考えられる。また、下肢手術であっても、術後荷重が可能で動ける場合、VTE リスクも低いと考えられる。免荷や移動制限が必要な下肢手術は高リスクと考えても良い。

**エビデンスレベル :** Consensus

**投票結果 :** 賛成 96.15%、反対 0.00%、棄権 3.85% (強いコンセンサス)

## CQ 2 : 術後免荷が不要な膝関節鏡視下手術を受ける患者に、ルーチンの VTE 予防は必要か？

著者 : Renny A. Cárdenas, Carlos G. Sánchez Valenciano 翻訳者 : 石橋恭之

**推奨 :** 膝関節鏡下手術を受ける健康患者全てにルーチンの血栓予防を推奨する十分なエビデンスはない。

**エビデンスレベル :** Moderate

**投票結果 :** 賛成 96.15%、反対 0.00%、棄権 3.85% (強いコンセンサス)

## CQ 3 : 術後長期間の免荷が必要な膝関節鏡視下手術を受ける患者に対し、最適な VTE 予防法は何か？

著者 : Manuel G. Mazzoleni, Maxime Fabre-Aubrespy, Ryan W. Paul, Fotios P. Tjoumakaris, Filippo Randelli 翻訳者 : 石橋恭之

**推奨 :** 膝関節鏡手術後の免荷と VTE 発生率との相関を具体的に検討した文献はない。そのため、この患者集団に対する特定の予防策を推奨することはできない。免荷が既知の VTE 危険因子であることを考慮すると、高い出血リスクが存在するか、術後出血を生じない限り、これらの患者に対するルーチンの VTE 予防を支持する。

**エビデンスレベル :** Consensus

**投票結果 :** 賛成 92.00%、反対 4.00%、棄権 4.00% (強いコンセンサス)

## CQ 4 : 前十字靱帯 (ACL) 再建術を受ける患者にとって最適な VTE 予防法は？

著者 : Mohammad S Abdelaal, Usama H. Saleh, Hamed Vahedi 翻訳者 : 藤澤隆弘

**推奨 :** 健康な成人患者において、ACL 再建術後の VTE リスクはわずかである。PE および症候性 DVT の予防として低分子量ヘパリン (LMWH)、アスピリン、またはリバーロキサパンの使用を推奨するエビデンスは低から中程度である。同様に、無症候性 DVT の予防として LMWH の使用を推奨するエビデンスについても、無治療と比較しても非常に低いレベルのものしかない。LMWH、アスピリン、およびリバーロキサパンの間で有害事象 (大出血および小出血を含む) の発生率に差はないが、既存の研究では発生件数が少ないため、この安全性に関するデータは限定的である。したがって、併存疾患、荷重の状態、固定の使用などの要因を考慮した適切なリスク層別化が必要である。

**エビデンスレベル :** Moderate

**投票結果 :** 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

## CQ 5 : 股関節鏡手術 (HA) を受ける患者にルーチンの VTE 予防は必要か？

著者 : Damian R. Griffin, Óliver Marín-Peña, Marc W. Nijhof 翻訳者 : 藤澤隆弘

**推奨 :** HA 後の VTE リスクは低く、ルーチンの VTE 予防は必要ない。特定のリスク因子を持つ患者には、VTE 予防を考慮する。

**エビデンスレベル :** Limited

**投票結果 :** 賛成 92.31%、反対 7.69%、棄権 0.00% (強いコンセンサス)

## CQ 6 : ミニオープン大腿骨寛骨臼骨形成術 (FAO) を受ける患者にルーチンの VTE 予防は必要か？

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**推奨 :** この疑問に関するエビデンスはほとんどない。利用可能なエビデンスによると、FAO を受ける標準的なリスクの患者において、アスピリンは VTE に対する有効な予防薬であることが示唆される。

**エビデンスレベル :** Low

**投票結果 :** 賛成 88.46%、反対 7.69%、棄権 3.85% (強いコンセンサス)

## CQ7：VTE 予防または活動性 VTE 治療のために抗凝固薬療法を受けているアスリートは、どのように管理されるべきか？

著者：John P. Prodoehl, William L. Johns, Marcos Arêas Marques, Marccone L. Sobreira, Sommer Hammoud 翻訳者：藤澤隆弘

**推奨：**スポーツ選手における VTE の最適な管理に関するコンセンサスは得られていない。活動性 VTE の治療は、早期運動療法、少なくとも 3 カ月間継続した抗凝固薬療法、そして治療期間中のコンタクトスポーツの制限である。薬剤の選択は、患者、医師、およびスポーツ関連の要因に従って調整する必要がある。しかし、直接阻害型経口抗凝固薬 (DOAC) を支持する報告もあり、それにより長期の抗凝固薬療法を必要とするアスリートのスポーツ復帰を早められる可能性があるとされている。活動性 VTE の治療を受けているアスリートは、最初の診断から 3 週間後に低リスクの運動 (水泳など) の開始、6 週間後に非接触型スポーツへの完全復帰が許容される。

**エビデンスレベル：**Consensus

**投票結果：**賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

## QUESTION 1: Concerning VTE risk, which surgeries can be considered major, and which surgeries can be considered non-major in orthopaedic sports surgery?

**RECOMMENDATION:** Overall, venous thromboembolism (VTE) incidence in sports surgery is low, and risk of VTE increases with immobilization and non-weight bearing. For this reason, upper extremity sports procedures are considered non-major concerning VTE risk due to the low impact on patient ambulation and post-operative mobility. Lower extremity procedures can be considered non-major if patients can weight bear and mobilize post-operatively. Patients undergoing lower extremity sports procedures that places weight bearing restriction and/or limits ambulation may be considered major.

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## QUESTION 2: Is routine VTE prophylaxis required for patients undergoing knee arthroscopy who will be allowed to fully weight bear after surgery?

**RECOMMENDATION:** There is insufficient evidence to recommend routine thromboprophylaxis to all otherwise healthy patients undergoing a knee arthroscopic procedure.

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### QUESTION 3: What is the most optimal VTE prophylaxis for patients undergoing arthroscopic knee surgery who are instructed to remain non-weight bearing for a prolonged period of time?

**RECOMMENDATION:** There are no studies in the literature that have specifically investigated the correlation between non-weightbearing after knee arthroscopy and the incidence of venous thromboembolism (VTE). Consequently, no specific prophylactic measures have been recommended for this patient population. Considering that non-weight bearing is a known risk factor for VTE, we support the routine use of VTE prophylaxis in these patients unless a high risk of bleeding is present or postoperative bleeding occurs.

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### QUESTION 4: What is the most optimal VTE prophylaxis for patients undergoing ACL reconstruction?

**RECOMMENDATION:** There is a small risk of venous thromboembolism (VTE) following anterior cruciate ligament (ACL) reconstruction in healthy adult patients. There is moderate- to low-evidence supporting the use of low-molecular-weight heparin (LMWH), aspirin (ASA) or rivaroxaban in the prevention of pulmonary embolism (PE) and symptomatic deep venous thrombosis (DVT). Similarly, there is a very low level of evidence supporting the use of LMWH in preventing asymptomatic DVT when compared to no treatment. No difference in the rate of adverse events (including major and minor bleeding) between LMWH, ASA and rivaroxaban has been shown, although data on this safety endpoint is limited due to low numbers of events in existing studies. To this end, appropriate risk stratification, considering factors such as medical comorbidities, weight-bearing status, and the use of immobilization, is therefore necessary.

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## QUESTION 5: Do patients undergoing hip arthroscopy require routine VTE prophylaxis?

**RECOMMENDATION:** The risk of venous thromboembolism (VTE) after hip arthroscopy (HA) is low and routine VTE prophylaxis is not required. In patients with particular risk factors, VTE prophylaxis might be considered.

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## QUESTION 6: Should patients undergoing mini-open femoroacetabular osteoplasty receive routine VTE prophylaxis?

**RECOMMENDATION:** There is dearth of data related to this question. Available evidence suggests that aspirin is an effective prophylactic agent against venous thromboembolism (VTE) in standard-risk patients undergoing mini-open femoroacetabular osteoplasty (FAO).

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## QUESTION 7: How should athletes receiving chemical anticoagulation for VTE prophylaxis or treatment of active VTE be managed?

**RECOMMENDATION:** There is no consensus regarding the optimal management of venous thromboembolism (VTE) in athletes. Treatment of active VTE consists of early mobilization and uninterrupted anticoagulation for at least 3 months with abstinence from contact sports during the entire treatment duration. The choice of pharmacologic agent should be tailored according to patient-, physician-, and sport-related factors. However, some authors favor direct-acting oral anticoagulant agents (DOAC), which may allow earlier return to sport in athletes requiring prolonged anticoagulation. Athletes receiving treatment for active VTE may begin low-risk exercises (e.g., swimming) 3 weeks after initial diagnosis, progressing to full participation in non-contact sports at 6 weeks.

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PART IX

# Trauma

<監訳者>

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**CQ 1 : 多発整形外科外傷患者における最適な VTE 予防法とは？**

著者 : Abdulaziz N. Aljurayyan, Ahmed A. Alabdali, Ryan K. Harrison 翻訳者 : 依光正則

**推奨 :** 多発整形外科外傷患者に対する VTE 予防策は多種多様で、その効果もさまざまであるが、既存の文献によると低分子量ヘパリン (LMWH) が最適な選択肢であると考えられる。

エビデンスレベル : Acceptable

投票結果 : 賛成 86.36%、反対 9.09%、棄権 4.55% (強いコンセンサス)

**CQ 2 : 骨折と内臓損傷の両方を伴う多発外傷患者に対する最適な VTE 予防策とは？**

著者 : William H. Geerts, Abdulaziz N. Aljurayyan, Malin S. Carling 翻訳者 : 依光正則

**推奨 :** 骨折および内臓損傷のある患者では、出血のリスクが許容され次第すぐに抗凝固剤ベースの血栓予防を開始すべきである。出血リスクが高い患者においては、可能であれば両下肢の圧迫による血栓予防 (理学的血栓予防) を実施すべきである。

エビデンスレベル : Strong

投票結果 : 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

**CQ 3 : 整形外科外傷患者の急性期出血量を判定し、術中出血量を予測する最善の方法は？**

著者 : Justin E. Kleiner, Paul Tornetta III 翻訳者 : 依光正則

**推奨 :** 外傷患者の急性期出血量を評価し、輸血の必要性を予測するため、多くの因子が研究されてきた。適切なリスク層別化を行うには、患者のバイタルサイン、検査データ、外傷、および病歴を考慮する必要がある。

エビデンスレベル : Low

投票結果 : 賛成 88.37%、反対 4.65%、棄権 6.98% (強いコンセンサス)

**CQ 4 : 手術を要する急性下肢外傷を有し、抗血小板および／または抗凝固療法を受けている患者の最適な管理とは？**

著者 : Dragan K. Radoičić, Francisco Chana-Rodríguez, Antonio Benjumea-Carrasco, Jesús Gómez-Vallejo 翻訳者 : 依光正則

**推奨 :** 手術を要する急性下肢外傷を有し、抗血小板薬および／または抗凝固薬を服用している患者の最適な管理には、出血リスクと血栓症リスクを比較検討するリスクベネフィット評価が必要である。外傷の緊急性や程度、患者の凝固状態に応じて、手術延期と凝固状態のモニタリング、周術期のブリッジング療法、または抗凝固療法の迅速リバーズを行うことが最適な管理につながる。

ほとんどの研究において、アスピリン投与患者は、遅延することなく安全に手術を行うことができると推奨されている。経口抗凝固薬を服用している患者では、凝固検査を実施する必要がある。手術を遅延できない場合は、抗凝固リバーズ剤を投与する必要がある。最近の文献では、リバーズ剤の使用は下肢外傷手術後の有害な転帰には繋がらないことが示されている。また、股関節骨折の一部の患者群においては、抗凝固療法中であっても早期外科的治療を行うことが賢明であると考えられる。

エビデンスレベル : Limited

投票結果 : 賛成 90.91%、反対 6.82%、棄権 2.27% (強いコンセンサス)

**CQ 5 : 整形外科外傷の VTE リスクにおいて、どの手術が高リスクで、どの手術が低リスクと考えられるか？**

著者 : Justin E. Kleiner, Marc F. Swiontkowski, Paul Tornetta III 翻訳者 : 依光正則

**推奨 :** 上肢および足関節より遠位の手術は、低リスクと考えられる。VTE リスクは、下腿遠位 (または足関節) から骨盤までの下肢で増加し、より近位部の手術になるにつれ危険性も高まる。手術部位に加え、手術時間と予想される術後の運動制限も考慮する必要がある。

エビデンスレベル : Moderate

投票結果 : 賛成 95.56%、反対 4.44%、棄権 0.00% (強いコンセンサス)

**CQ 6 : 保存療法が行われる単独下肢骨折患者に対してルーチンの VTE 予防は適応となるか？**

著者 : Abtin Alvand, Raja Bhaskara Rajasekaran, Marc F. Swiontkowski 翻訳者 : 上原健敬

**推奨 :** 保存療法が行われる単独下肢骨折患者に対するルーチンの VTE 予防は必要ない。単独下肢骨折において VTE 予防が必要となるのは、重度の内科的併存症や重度の活動制限、凝固異常の危険因子を有するハイリスク患者に限られる。

エビデンスレベル : Moderate

投票結果 : 賛成 95.65%、反対 4.35%、棄権 0.00% (強いコンセンサス)

## CQ7: 手術を行わず下肢を固定されている（ギプスなど）患者に対してルーチンの VTE 予防は適応となるか？

著者: Banne Nemeth, Francisco Palma-Arjona, Alberto D. Delgado-Martinez, James W.M. Kigera 翻訳者: 上原健敬

推奨: 下肢を固定されている患者へのルーチンの VTE 予防は適応ではない。

エビデンスレベル: Moderate

投票結果: 賛成 86.96%、反対 10.87%、棄権 2.17% (強いコンセンサス)

## CQ8: 下肢外傷患者において、固定期間は VTE 予防策の選択に影響するか？

著者: Aydin Gahramanov, Saad Tarabichi, Charles-Marc Samama 翻訳者: 上原健敬

推奨: 下肢外傷の固定期間は VTE 予防策の選択に影響しない。

エビデンスレベル: Moderate

投票結果: 賛成 93.18%、反対 4.55%、棄権 2.27% (強いコンセンサス)

## CQ9: 骨接合術を受ける大腿骨近位部骨折患者における、最適な VTE 予防策は何か？

著者: Andrew J. Hughes, Dheenadhayalan Jayaramaraju, Svetlana A. Bozhkova, Aleksandar R. Lešić, Nagashree Vasudeva, Alina Kasimova, Velmurugesan P. Sundaram, Jaimo Ahn, Chad A. Kruege 翻訳者: 上原健敬

推奨: 骨接合術を受ける大腿骨近位部骨折患者では、個別のリスク評価を行ったうえで理学的小および薬物的 VTE 予防策が推奨される。外科手術が遅延する場合、術前の薬物的予防も考慮すべきである。薬剤による血栓予防は術後血栓形成促進状態が持続する期間（閉創 12 時間後から少なくとも 28 日間）は継続すべきである。

エビデンスレベル: Moderate

投票結果: 賛成 95.56%、反対 2.22%、棄権 2.22% (強いコンセンサス)

## CQ10: 大腿骨近位部骨折に対する人工関節置換術（人工骨頭置換術または THA）後の患者に対する最適な VTE 予防策は何か？

著者: Stephen L. Kates, Eduardo A. Salvati, Lars G. Johnsen 翻訳者: 上原健敬

推奨: 人工関節置換術（人工骨頭置換術または THA）を受けた大腿骨近位部骨折患者は VTE リスクが高まるため、何らかの薬物的血栓予防を受けるべきである。このような患者群への VTE 予防としてアスピリンの有効性が数々の研究で示されている。

エビデンスレベル: Strong

投票結果: 賛成 84.78%、反対 8.70%、棄権 6.52% (強いコンセンサス)

## CQ11: 骨盤あるいは下肢の脆弱性骨折の患者に対してルーチンの VTE 予防は必要か？

著者: Taylor D'Amore, Guillermo Araujo, Iván J. Salce, Nigel D. Rossiter 翻訳者: 上原健敬

推奨: 骨盤あるいは下肢の脆弱性骨折を有する患者への VTE 薬物的予防は、内科的併存症を考慮した出血リスクよりも VTE リスクが上回る場合に限り推奨される。VTE 薬物的予防が受けられない患者に対しては、間欠的空気圧迫法 (IPC) の使用を検討すべきである。

エビデンスレベル: Low

投票結果: 賛成 95.56%、反対 4.44%、棄権 0.00% (強いコンセンサス)

## CQ12: 股関節骨折の保存療法患者に対し、VTE 予防を施行すべきか？

著者: Banne Nemeth, Clifford W. Colwell 翻訳者: 大島康史

推奨 (1): 転位がなく手術適応でない股関節骨折の患者では、低分子量ヘパリン (LMWH)、フォンダパリヌクス、低用量未分画ヘパリン (LDUFH)、用量調節ビタミン K 拮抗薬 (VKA)、もしくはアスピリンなどによる標準的な予防を検討すべきである。

推奨 (2): 転位はあるが保存療法が適応される股関節骨折の患者では、股関節骨折に対し手術を施行する患者と同等の VTE 予防を検討すべきである。

エビデンスレベル: Limited

投票結果: 賛成 97.78%、反対 2.22%、棄権 0.00% (強いコンセンサス)

**CQ13: 膝周囲骨切り術後の患者にルーチンの VTE 予防は必要か？**

著者: Yasushi Oshima, Hasan R. Mohammad, Tokifumi Majima, Hemant G. Pandit 翻訳者: 大島康史

推奨: 膝周囲骨切り術後の患者にはルーチンの理学的および薬物的 VTE 予防法のどちらか、もしくは併用が推奨される。

エビデンスレベル: Moderate

投票結果: 賛成 93.48%、反対 2.17%、棄権 4.35% (強いコンセンサス)

**CQ14: 膝蓋骨骨折単独の患者への手術療法もしくは保存療法でルーチンの VTE 予防は必要か？**

著者: Kara M. McConaghy, Geoffrey H. Westrich, Nicolas S. Piuze 翻訳者: 大島康史

推奨: 膝蓋骨骨折単独の患者ではルーチンの VTE 予防の適応はないが、VTE の危険因子をもった患者では検討すべきである。

エビデンスレベル: Limited

投票結果: 賛成 93.02%、反対 6.98%、棄権 0.00% (強いコンセンサス)

**CQ15: 脛骨／腓骨骨折観血的手術における WALANT 法 (wide-awake local anesthesia no tourniquet) は VTE 発生リスクを増加させるか？**

著者: Thomas Volk, Jeffrey J. Mojica, Azlina A. Abbas 翻訳者: 大島康史

推奨: 脛骨／腓骨骨折観血的手術における WALANT 法が、脛骨／腓骨骨折に対する他の手技と比較して、VTE リスクを増加させるかは不明である。WALANT かどうかに関わらず、既存の血栓塞栓症のガイドラインに沿った抗凝固薬の使用を推奨する。

エビデンスレベル: Moderate

投票結果: 賛成 95.35%、反対 4.65%、棄権 0.00% (強いコンセンサス)

**CQ16: 下肢の固定材抜去術の患者でルーチンの VTE 予防は必要か？**

著者: Karan Goswami, Tomas Roca-Sanchez, Nestor Moreno-Moreu 翻訳者: 大島康史

推奨: 下肢の固定材抜去術の患者は、VTE リスクが低いいため、ルーチンの VTE 予防は推奨しない。

エビデンスレベル: Limited

投票結果: 賛成 95.56%、反対 2.22%、棄権 2.22% (強いコンセンサス)

**CQ17: 上肢の固定材抜去術の患者でルーチンの VTE 予防は必要か？**

著者: Mohammad S. Abdelaal, Nestor Moreno Moreu 翻訳者: 大島康史

推奨: 上肢の固定材抜去術の患者では、VTE リスクはかなり低い。よって、このような患者では VTE 予防をルーチンで行う必要はない。VTE リスクが高い患者ではアスピリンの使用が考慮される。

エビデンスレベル: Consensus

投票結果: 賛成 97.78%、反対 2.22%、棄権 0.00% (強いコンセンサス)

## QUESTION 1: What is the most optimal VTE prophylaxis in patients with multiple orthopaedic injuries?

**RECOMMENDATION:** Although multiple forms of prophylaxis against venous thromboembolism (VTE) with variable effectiveness are available for patients with multiple orthopedic injuries, low-molecular-weight heparin (LMWH) is considered the most optimal choice based on available literature.

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## QUESTION 2: What is the optimal VTE prophylaxis for polytrauma patients with both fractures and visceral injuries?

**RECOMMENDATION:** In patients with fractures and visceral injuries, anticoagulant-based thromboprophylaxis should be commenced as soon as bleeding risk allows. Bilateral mechanical thromboprophylaxis, if possible, should be administered to patients who are at high bleeding risk.

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## QUESTION 3: What is the best way to determine acute blood loss and predict operative blood loss in trauma patients with orthopaedic injuries?

**RECOMMENDATION:** Multiple factors have been studied to assess blood loss in acute trauma patients, and to predict the need for transfusion. Adequate risk stratification involves consideration of the patient's vital signs, laboratory data, injuries, and medical history.

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## QUESTION 4: What is the optimal management of patients on antiplatelet and/or anticoagulation presenting with acute lower extremity trauma and needing surgery?

**RECOMMENDATION:** The optimal management of patients on antiplatelets and/or anticoagulants presenting with acute lower extremity trauma and needing surgery should involve a risk-benefit assessment weighing the risk of bleeding against the risk of thrombosis. Depending on the degree of urgency, extent of trauma and patient's coagulation status, the optimal approach may involve postponing the procedure and monitoring the coagulation status, perioperative bridging therapy, or acute reversal of anticoagulation.

Most studies recommend that patients receiving aspirin (ASA) can undergo surgery safely without delay. In patients taking oral anticoagulants, coagulation tests should be performed. If surgery cannot be delayed, anticoagulant reversal agents should be administered. Recent literature has suggested that the use of reversal agents does not lead to adverse outcomes following lower extremity trauma surgery. In addition, early surgical treatment of hip fractures despite anticoagulation may be prudent in a subgroup of patients.

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## QUESTION 5: Concerning VTE risk, which surgeries can be considered major and which surgeries can be considered non-major in orthopaedic trauma?

**RECOMMENDATION:** Surgical procedures in the upper extremity and distal to the ankle can be considered non-major. The risk of venous thromboembolism (VTE) increases in the lower limb from the distal leg (or ankle) to the pelvis, with higher risk associated with more proximal surgeries. In addition to location of surgery, length of surgery and expected post-operative mobility must be considered.

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## QUESTION 6: Is routine VTE prophylaxis indicated in patients with a single lower extremity fracture who do not require surgery?

**RECOMMENDATION:** Routine venous thromboembolism (VTE) prophylaxis is not routinely needed in patients with a single lower extremity (LE) fracture who do not require surgery. The need for VTE prophylaxis in patients with isolated LE fracture is restricted to high-risk individuals with significant medical comorbidities, severely limited activity or other coagulopathic risk factors.

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## QUESTION 7: Is routine VTE prophylaxis indicated in patients with immobilization of the lower extremity (e.g., casting) without surgery?

**RECOMMENDATION:** Routine venous thromboembolic (VTE) prophylaxis is not indicated in patients with immobilization of the lower extremity.

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## QUESTION 8: Does the duration of immobilization of patients with lower extremity injuries influence the choice of VTE prophylaxis?

**RECOMMENDATION:** Duration of immobilization in patients with lower extremity injuries does not influence the choice of venous thromboembolism (VTE) prophylaxis.

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## QUESTION 9: What is the most optimal VTE prophylaxis for patients undergoing internal fixation of a hip fracture?

**RECOMMENDATION:** Mechanical and pharmacological venous thromboembolism (VTE) prophylaxes are advised for patients undergoing internal fixation of a hip fracture, following an individualized risk assessment. In the setting of surgical delays, preoperative pharmacological prophylaxis should be considered. Pharmacological thromboprophylaxis should continue throughout the persistent postoperative prothrombotic state, commencing 12 hours post wound closure, and continuing for at least 28 days.

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## QUESTION 10: What is the optimal VTE prophylaxis for patients undergoing arthroplasty (hemiarthroplasty or total hip arthroplasty) for patients with hip fracture?

**RECOMMENDATION:** Hip fracture patients treated with arthroplasty are at higher risk of venous thromboembolism (VTE) and should receive some form of chemothromboprophylaxis. Studies demonstrate that aspirin (ASA) is an effective agent for prevention of VTE in this patient's population.

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## QUESTION 11: Is routine VTE prophylaxis required for patients with fragility fracture of the pelvis or lower extremity?

**RECOMMENDATION:** Chemoprophylaxis against venous thromboembolism (VTE) is recommended for patients with a fragility fracture of the pelvis or lower extremity as long as the risk of VTE outweighs the risk of bleeding given other medical comorbidities. The use of intermittent pneumatic compression (IPC) devices should be considered for those who cannot receive chemoprophylaxis.

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## QUESTION 12: Should VTE prophylaxis be administered to patients with a hip fracture who do not undergo surgery?

**RECOMMENDATION 1. :** For patients with a nondisplaced hip-fracture not requiring surgery, a standard prophylactic regimen of either low-molecular-weight- heparin (LMWH), fondaparinux, low dose unfractionated heparin (LDUFH), adjusted-dose vitamin K antagonist (VKA) or aspirin (ASA) should be considered.

**RECOMMENDATION 2. :** For patients with a displaced hip fracture who are treated conservatively, venous thromboembolism (VTE) prophylaxis should be considered in a similar fashion to hip fracture surgery patients.

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## QUESTION 13: Is routine VTE prophylaxis needed for patients undergoing osteotomy around the knee?

**RECOMMENDATION:** Routine use of mechanical and/or chemical thromboprophylaxis for patients undergoing osteotomy around the knee is recommended.

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### QUESTION 14: Is routine VTE prophylaxis required for patients with isolated patellar fracture who may or may not require surgery?

**RECOMMENDATION:** Routine thromboprophylaxis is not indicated for patients with isolated patellar fracture but should be considered for patients with risk factors for venous thromboembolism (VTE).

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### QUESTION 15: Does WALANT for tibia/fibula fracture fixation have an increased risk of VTE events?

**RECOMMENDATION:** Whether wide-awake local anesthesia no tourniquet (WALANT) for tibia/fibula fracture fixation has a risk of venous thromboembolism (VTE) compared to other techniques for tibia/fibula fracture is unknown. We recommend using anticoagulant prophylaxis as per existing thromboprophylaxis guidelines, independent of the technique used.

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### QUESTION 16: Should patients undergoing hardware removal of lower extremity require routine VTE prophylaxis?

**RECOMMENDATION:** Patients undergoing removal of hardware from lower extremity are at low risk of venous thromboembolism (VTE). Thus, routine VTE thromboprophylaxis is not recommended.

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## QUESTION 17: Should patients undergoing hardware removal of upper extremity require routine VTE prophylaxis?

**RECOMMENDATION:** Patients undergoing removal of hardware from the upper extremity are at extreme low risk of venous thromboembolism (VTE). Thus, routine use of VTE prophylaxis in these patients is not required. The use of aspirin as a VTE prophylaxis may be considered for those at high risk of VTE.

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PART X

# Spine

<監訳者>

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**CQ 1 : 脊椎手術を受ける患者において、周術期にルーチンの DVT スクリーニングは必要か？**

著者 : Andrea Angelini, Gentaro Kumagai, Olivier Q. Groot 翻訳者 : 熊谷玄太郎

**推奨 :** 脊椎手術を受ける患者に対しルーチンの DVT 検査をする意義はない。高齢者、脊椎損傷、VTE や悪性疾患の既往、頸椎症性脊髄症 (CSM)、歩行困難などの高リスク患者では、下肢静脈エコー検査を行うことが検討される。

エビデンスレベル : Limited

投票結果 : 賛成 96.43%、反対 3.57%、棄権 0.00% (強いコンセンサス)

**CQ 2 : VTE リスクに関して、どのような脊椎手術が高リスクあるいは低リスクとなるのか？**

著者 : Jose A. Canseco, Gregory R. Toci, Olivier Q. Groot, Joseph H. Schwab 翻訳者 : 熊谷玄太郎

**推奨 :** 脊椎手術において VTE リスクが高い手術手技には、腫瘍・外傷・感染に対する手術や、集中治療室での管理を要する手術、段階的あるいは前後同時アプローチを要する手術が含まれる。多椎体固定が必要な腰椎手術や前方アプローチ、頸椎後方固定術も高リスクと考えるべきである。一方で、小児の待機的手術、鏡視下椎間板切除術、頸椎前方固定術、腰椎あるいは頸椎除圧術はほとんどの場合低リスクと考えられる手術手技である。

エビデンスレベル : Moderate

投票結果 : 賛成 100.00%、反対 0.00%、棄権 0.00% (満場一致の強いコンセンサス)

**CQ 3 : 脊椎術後の硬膜外血腫への懸念は、VTE 予防策の選択に影響を与えるか？**

著者 : Olivier Q. Groot, David W. Polly Jr., Joseph H. Schwab 翻訳者 : 熊谷玄太郎

**推奨 :** 硬膜外血腫は、脊椎手術後の術後合併症として重篤ではあるが、その発生率は 0 ~ 1.8% と稀である。薬物的予防の安全性について明示したエビデンスはないが、非治療用量の抗凝固薬を脊椎術後に投与しても、脊椎硬膜外血腫のリスクが増加することはないと思われる。抗凝固薬の使用においては、脊椎硬膜外血腫のリスクと VTE 予防のベネフィットとのバランスを考慮し、更なる前向き研究が必要である。

エビデンスレベル : Limited

投票結果 : 賛成 96.30%、反対 0.00%、棄権 3.70% (強いコンセンサス)

**CQ 4 : 脊椎手術後に VTE の薬物的予防を施行する場合、いつから開始可能か？**

著者 : Jonathan N. Grauer, Jeremy L. Fogelson 翻訳者 : 熊谷玄太郎

**推奨 :** VTE に対する薬物的予防は、待機腰椎固定術であれば術後 24 ~ 48 時間以内に、出血のリスクが高い患者では術後 48 時間以内に開始可能と思われる。薬物的予防によるベネフィットについては、出血や血腫形成のリスクと天秤にかけ、慎重に検討すべきである。

エビデンスレベル : Limited

投票結果 : 賛成 88.46%、反対 0.00%、棄権 11.54% (強いコンセンサス)

**CQ 5 : 脊椎手術患者に VTE 予防策を施行する場合、手術椎間数、手術部位、手術アプローチ (低侵襲など) は、VTE 予防策の選択に影響を与えるか？**

著者 : Jose A. Canseco, Arun P. Kanhere, Ana Castel-Oñate, Alexander R. Vaccaro 翻訳者 : 熊谷玄太郎

**推奨 :** 多椎間の腰椎手術、特に前方アプローチで行われる手術の場合には、薬物的予防を検討すべきであると示唆するエビデンスはいくつかある。

エビデンスレベル : Limited

投票結果 : 賛成 96.30%、反対 0.00%、棄権 3.70% (強いコンセンサス)

**CQ 6 : 脊椎手術患者における VTE 薬物的予防として、アスピリンは有効か？**

著者 : Nicholas M. Siegel, Mark Lambrechts, Chadi Tannoury, Alexander R. Vaccaro 翻訳者 : 熊谷玄太郎

**推奨 :** アスピリンは整形外科手術後の VTE 発生率を減少させる可能性があるが、脊椎手術を受ける患者において、この効果を検討した質の高い研究はない。われわれの総意としては、薬物的予防のポテンシャルと出血増加のリスクとを比較検討するよう推奨する。

エビデンスレベル : Consensus

投票結果 : 賛成 96.43%、反対 0.00%、棄権 3.57% (強いコンセンサス)

**CQ7：脊椎手術を受ける患者において、脊椎以外の疾患に対しアスピリンを服用中の場合、その最適な管理方法は？**

著者：Chadi Tannoury, Ryan M. Sutton 翻訳者：魚谷弘二

**推奨：**脊椎手術に際して、心血管疾患の1次もしくは2次予防のために使用している低用量アスピリン（81mg～500mg）であれば、術前1日から3日間の中止でよい。1日当たりに内服しているアスピリンの量が1gより多い場合は、術前に少なくとも7日間は休薬すべきである。ただし、より注意が必要な心疾患の既往がある患者では、脊椎手術の周術期には低用量アスピリン（81mg）を継続するのが妥当である。

エビデンスレベル：Moderate

投票結果：賛成 89.29%、反対 10.71%、棄権 0.00%（強いコンセンサス）

**CQ8：脊椎手術を受ける患者において、脊椎以外の疾患に対しワルファリンを服用中の場合、その最適な管理方法は？**

著者：Chadi Tannoury, Ryan M. Sutton 翻訳者：魚谷弘二

**推奨：**ワルファリン（クマジン）は脊椎手術の少なくとも5日前には中止し、PT-INRは1.2以下とすべきである。

エビデンスレベル：Moderate

投票結果：賛成 92.86%、反対 3.57%、棄権 3.57%（強いコンセンサス）

**CQ9：脊椎以外の疾患に対して抗凝固薬を使用している患者では、脊椎手術前の抗凝固薬中止に際して、周術期にヘパリン置換療法が必要か？**

著者：Chadi Tannoury, Ryan M. Sutton 翻訳者：魚谷弘二

**推奨：**脊椎周術期における抗凝固薬のヘパリン置換療法は、術前の抗凝固薬中止後に起こりうる血栓塞栓イベントを予防する効果においてプラセボに勝るわけではない。それだけでなく、抗凝固薬のヘパリン置換療法は大量出血の高リスクとなるとされている。VTEハイリスク患者において、主治医の裁量でヘパリン置換療法を検討する場合は、未分画ヘパリンもしくは低分子量ヘパリンの選択が妥当である。

エビデンスレベル：Limited

投票結果：賛成 89.29%、反対 3.57%、棄権 7.14%（強いコンセンサス）

**CQ10：脊椎外傷患者の周術期において、ルーチンのVTE予防を行う必要はあるか？**

著者：Adwin Denasty, Addisu Mesfin 翻訳者：魚谷弘二

**推奨：**脊椎外傷患者はVTEリスクが高くなる。脊椎外傷患者の周術期に推奨されるVTE予防策は、脊髄損傷（SCI）の有無や脊椎損傷の高位、年齢など、患者個人の要因により異なる。

エビデンスレベル：Moderate

投票結果：賛成 100.00%、反対 0.00%、棄権 0.00%（満場一致の強いコンセンサス）

**CQ11：硬膜損傷の有無により、脊椎手術後のVTE予防策の選択肢は変わるか？**

著者：Brian A. Karamian, Tony Tannoury, Khoa S. Tran, Alexander R. Vaccaro 翻訳者：魚谷弘二

**推奨：**脊椎手術後のVTE発生率は、偶発的な硬膜損傷をきたした患者で有意に高くなり、その数値は硬膜損傷のない患者と比較しておよそ1.5倍にもなる。そのため、脊椎手術後に硬膜損傷の起きた患者では、積極的なVTE予防策を検討しなくてはならない。

エビデンスレベル：Limited

投票結果：賛成 92.31%、反対 3.85%、棄権 3.85%（強いコンセンサス）

**CQ12：侵襲の大きな脊椎手術を行う小児患者では、ルーチンのVTE予防を行うべきか？**

著者：Harold A. Fogel, Ali Parsa, Stephen DiMaria 翻訳者：魚谷弘二

**推奨：**侵襲の大きな脊椎手術を行う小児患者において、ルーチンにVTE予防薬を投与することは、現在のエビデンスでは推奨されていない。薬物的予防は複数のリスク因子を持つ患者に限られるべきである。理学的VTE予防に関しては、危険性は少ないものの、効果については議論の余地がある。

エビデンスレベル：Limited

投票結果：賛成 96.30%、反対 3.57%、棄権 0.00%（強いコンセンサス）

## QUESTION 1: Is routine screening for DVT required in the preoperative and/or post-operative period for patients undergoing spine procedures?

**RECOMMENDATION:** There is no role for routine screening for deep venous thrombosis (DVT) in patients undergoing spine procedures. Doppler ultrasonography surveillance may be considered in high-risk surgical patients including those who are older, with spine injury, personal history of VTE, malignancy, cervical spondylotic myelopathy (CSM), and/or non-ambulatory.

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## QUESTION 2: Concerning VTE risk, which surgeries can be considered high-risk, and which surgeries can be considered low-risk in spine surgery?

**RECOMMENDATION:** Concerning venous thromboembolism (VTE) risk in spine surgery, high-risk procedures include those performed for oncologic, traumatic, or infection, as well as those requiring intensive care unit (ICU) admission, multiple stages, or combined approaches. Lumbar procedures including long-segment fusions or procedures utilizing an anterior approach, as well as posterior cervical fusions, should also be considered high-risk. On the other hand, most elective pediatric procedures, microdiscectomies, anterior cervical fusions, and lumbar or cervical decompressions may be considered low-risk procedures.

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## QUESTION 3: Does the concern for epidural hematoma influence the choice for VTE prophylaxis after spine surgery?

**RECOMMENDATION:** Epidural hematoma is a feared yet rare postoperative complication after spinal surgery, with symptomatic rates ranging from 0% to 1.8%. Although there is no published evidence to precisely define the safety of chemoprophylaxis, it seems that postoperative anticoagulants in non-therapeutic doses can be administered without an increased risk of spinal epidural hematoma. Prospective studies are required to better balance the risks and benefits of prophylactic anticoagulants regarding spinal epidural hematomas and Venous thromboembolism (VTE).

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## QUESTION 4: When can VTE chemoprophylaxis, if to be used, be started following spine procedures?

**RECOMMENDATION:** Venous Thromboembolism (VTE) chemoprophylaxis can probably be started within 24 - 48 hours following elective lumbar fusions, and within 48 hours following patients considered to be higher risk with bleeding. Chemoprophylaxis benefits should be carefully weighed against the risks of bleeding and hematoma formation.

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## QUESTION 5: If VTE prophylaxis is to be administered, does the number of levels, and/or the anatomical location, and/or surgical approach (i.e., minimally invasive) influence the choice of VTE prophylaxis for patients undergoing spinal surgery?

**RECOMMENDATION:** There is some evidence suggesting that chemoprophylaxis should be considered in patients undergoing multi-level lumbar spine surgery, especially when performed through an anterior approach.

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## QUESTION 6: Is aspirin a viable chemoprophylaxis for VTE in patients undergoing spine surgery?

**RECOMMENDATION:** While aspirin (ASA) may reduce venous thromboembolism (VTE) after orthopaedic procedures, there are no high-quality studies addressing this issue in patients undergoing spine surgery. We recommend surgeons weigh the potential benefits of chemoprophylaxis with known risks of increased bleeding.

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## QUESTION 7: What is the optimal protocol for management of patients who are on aspirin for a non-spine related disorder prior to spine surgery?

**RECOMMENDATION:** Prior to spine surgery, low dose-aspirin (LD-ASA) (81 mg - 500 mg) used for primary and secondary cardiovascular prevention, can be stopped for one to three days. For ASA doses > 1 g per day, ASA should be stopped for at least seven days prior to surgery. However, in patients with extensive cardiac history, it is reasonable to maintain LD-ASA (81 mg) throughout spine surgery.

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## QUESTION 8: What is the optimal protocol for management of patients who are being treated with warfarin for a non-spine related disorder prior to spine surgery?

**RECOMMENDATION:** Warfarin (Coumadin) should be discontinued at least 5 days before spine surgery, and the international normalized ratio (INR) goal should be 1.2 or less.

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## QUESTION 9: In patients on anticoagulants for a non-spine disorder, is perioperative bridging therapy necessary following cessation of anticoagulation prior to spine surgery?

**RECOMMENDATION:** Perioperative bridging anticoagulation therapy is not superior to placebo in preventing thromboembolic events following cessation of anticoagulation prior to spine surgery. Additionally, bridging anticoagulation therapy can be associated with higher risk of major bleeding.

If a bridging therapy is contemplated in high-risk patients, and at the discretion of the treating physician, unfractionated heparin and low-molecular-weight heparin (LMWH) are reasonable options.

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## QUESTION 10: Do patients with spine trauma require routine VTE prophylaxis before and after surgery?

**RECOMMENDATION:** Patients suffering from traumatic spine injury are at an increased risk for venous thromboembolism (VTE). Recommendations for VTE prophylaxis before and after surgery in spine trauma varies based on pertinent factors such as presence of spinal cord injury (SCI), segment of the spine involved and age.

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## QUESTION 11: Does the presence of a dural tear influence the choice for VTE prophylaxis after spine surgery?

**RECOMMENDATION:** Following spine surgery, the rate of venous thromboembolism (VTE) is significantly higher in patients with incidental durotomy (almost 1.5 times) compared to patients without. Therefore, in patients with dural tears post spine surgery, vigorous VTE prophylaxis therapies should be considered.

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## QUESTION 12: Should pediatric patients undergoing major spine procedures require routine VTE prophylaxis?

**RECOMMENDATION:** Routine administration of pharmacologic venous thromboembolism (VTE) prophylaxis for major spinal procedures in pediatric patients is not supported by current evidence. Chemoprophylaxis should be limited to patients with multiple risk factors. Controversy exists on the utility of mechanical prophylaxis although poses minimal risk.

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## 整形外科領域の静脈血栓塞栓症(VTE)における国際コンセンサス

2023 年 3 月 2 日発行

編 集 稲葉 裕、池 裕之

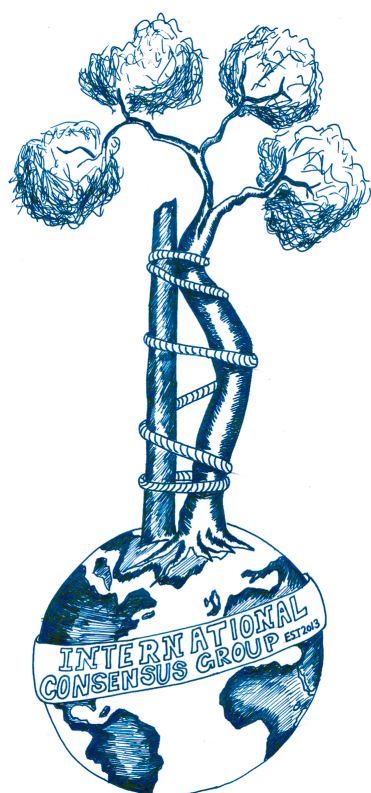
編集補佐 齊藤 志保、菅波 彩佳

発行人 ICM 翻訳プロジェクトチーム

発行所 横浜市立大学 整形外科学教室  
〒236-0004 神奈川県横浜市金沢区福浦 3-9  
Tel: 045-787-2655  
**ISBN 978-4-600-01188-8**

印 刷 株式会社グローバルプリント  
〒231-0023 神奈川県横浜市中区山下町 255-1-207  
Tel: 045-263-9880  
<https://www.globalprint.co.jp/>

ISBN978-4-600-01188-8  
(非売品)



# INTERNATIONAL CONSENSUS MEETING (ICM) on VENOUS THROMBOEMBOLISM