1.2. PREVENTION: ANTIMICROBIALS

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QUESTION 1: Is there a role for oral antibiotics in the prevention of infection in patients with draining wounds following spinal surgery?

RECOMMENDATION: There is no reliable evidence for the use of prophylactic oral antibiotic therapy in patients with draining wounds after spine surgery.

LEVEL OF EVIDENCE: Consensus

DELEGATE VOTE: Agree: 93%, Disagree: 7%, Abstain: 0% (Super Majority, Strong Consensus)

RATIONALE

The incidence of spinal surgical site infection (SSI) has been reported to be from 0.7–16% [1–3]. Surgical drains are used in spine surgery to avoid the risk of a hematoma formation leading to potential neurological deficit [4]. Drains retained for a longer period have been shown to have a higher rate of bacterial contamination [5]. However, not using a drain has been found to be associated with the development of late-onset SSI [6,7]. Therefore, the use of drains decreases wound drainage and consequently decreases infection rates [8,9]. Prophylactic antibiotic cover for 24 hours has now become a standard of care following orthopaedic procedures [10].

Since the first systematic review on prophylactic measures against spinal SSI was published by Brown et al. in 2004 [11], there has been a considerable increase in the preventive strategies documented in the spine literature. However, many studies are of lower methodological quality with significant heterogeneity [12].

There was only one prospective randomized study showing no significant difference in the infection rates between patients receiving prophylactic antibiotic coverage for 24 hours or for the entire duration that the drain was in place. This study was on thoracolumbar fractures. It was not clear if the antibiotic cover was administered orally or parenterally [13]. In a review of 560 cases of closed suction drainage in single level lumbar decompressions, Kanayama et al. did not report on the use of prophylactic oral antibiotics [14]. Similarly, a 2018 systematic review by Yao et al. identified 11 randomized controlled trials (RCTs), 51 case-controlled studies (CCS) and 77 case series. They reported wide variations in the surgical indications, approaches and definitions of SSI. They found strong evidence that closed-suction drainage does not affect SSI rates, but had no mention of the use of prophylactic oral antibiotic therapy [15].

There were many studies that evaluated the risk factors for wound complications following spine surgery [16–18]. Past studies are archaic in nature with very little contribution or relevance to these authors. A staged treatment algorithm for spine infections did not specify or address the indication for oral antibiotics to prevent infection in draining wounds [19]. A recent retrospective study attributed the drain volume and time to the risk factors for SSI after lumbar surgery. There was no direct reference to the impact of oral or parenteral antibiotics in their study [13,20].

A systematic evidenced-based review included 36 observational studies involving 2,439 patients. However, these were non-interventional studies to evaluate the independent risk factors for patients developing SSIs following spine surgery [17]. In their systematic review and meta-analysis of wound drains in non-instrumented lumbar decompression surgery, Davidoff et al. included 5,327 cases who received drains. They found that the SSI rates were unaffected by the routine use of drains. However, none of these patients had prophylactic oral antibiotics [21]. Ho et al. reported a retrospective review of 70 patients who had undergone single-level lumbar discectomy. They suggested that surgical drains do not increase SSI risk and that drain tip cultures allow detection of postoperative infection at a very early stage. They found that this would lead to quicker initiation of antibiotic treatment [22].

Apart from a prospective randomized study that suggested no difference in the infection rates, there are no studies directly linking the role of oral antibiotics in the prevention of infection in patients with draining wounds following spine surgery [13]. Therefore, in the absence of reliable evidence, only a consensus recommendation can be made based on clinical opinion.

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QUESTION 2: Is there a role for the addition of gentamicin to perioperative prophylactic antibiotics in spine surgery?

RECOMMENDATION: No, we recommend AGAINST the inclusion of gentamicin for perioperative prophylaxis in spine surgery. There is no data suggesting that the addition of gentamicin to systemic perioperative prophylactic antibiotic regimens decreases the rate of postoperative infections, and strong evidence showed that it is associated with harm (namely nephrotoxicity). The question of the use of local/topical gentamicin is unresolved.

LEVEL OF EVIDENCE: Strong

DELEGATE VOTE: Agree: 62%, Disagree: 15%, Abstain: 23% (Super Majority, Weak Consensus)

RATIONALE

The use of gentamicin to expand the gram-negative activity for perioperative antimicrobial prophylaxis in spine surgery has been considered for decades, yet positive outcomes data for this practice are lacking. Pons et al. reported on a randomized, blinded study of 826 patients undergoing neurosurgical procedures, including spine surgery, and found similar surgical site infection (SSI) rates for those assigned to ceftizoxime or vancomycin and gentamicin [1]. Ramo et al. reported on a multivariate analysis of 428 posterior spinal fusion patients and found that the addition of an aminoglycoside did not lower the SSI rate [2]. In a mixed population of more than 11,000 orthopaedic surgery patients treated over 5 years in the United Kingdom, Walker et al. noted no difference in SSI rates during a period when a combination of flucloxacillin and gentamicin was given for prophylaxis compared to one where co-amoxiclav was the prophylactic regimen of choice [3].

The association of aminoglycoside prophylaxis (even single-dose) for orthopaedic surgery and acute kidney injury (AKI) has now been well-documented. Dubrovskaya et al. reviewed more than 4,000 patients undergoing orthopaedic surgery, comparing those receiving a single dose of gentamicin combined with another antibiotic to those receiving non-aminoglycoside prophylaxis alone. Although for all patients the addition of gentamicin was not associated with AKI, gentamicin was associated with a statistically significantly higher rate of AKI for those undergoing spine surgery [4]. Bell et al. reported on a Scottish initiative where routine surgical prophylaxis was changed from cefuroxime to flucloxacillin and gentamicin (single-dose) between 2006 and 2010. Among 7,666 patients undergoing orthopaedic surgery, the gentamicin-containing regimen was associated with a 94% higher incidence of AKI [5]. Finally, in the previously-cited study by Walker et al., a change from routine prophylaxis with flucloxacillin and gentamicin to co-amoxiclav alone was associated with a 63% reduction in postoperative AKI [3].

Two meta-analyses on the association of gentamicin prophylaxis with nephrotoxicity have been published. Luo et al. compared the use of gentamicin and flucloxacillin to cefuroxime alone in studies of diverse surgery types. The risk of postoperative renal impairment was higher in the gentamicin group, especially for those undergoing orthopaedic surgery [6]. Srisung et al. analyzed 11 studies containing 18,354 patients comparing gentamicin versus non-gentamicin surgical prophylaxis regimens. Using random effects modeling, gentamicin prophylaxis in orthopaedic surgery was associated with a significantly higher risk of AKI (risk rate (RR) 2.99; 95% confidence interval (CI): 1.84, 4.88) [7].

Data regarding the use of topical or local wound gentamicin are limited. In a single-center study, van Herwijnen et al. reported a higher SSI rate for patients undergoing scoliosis surgery who received wound irrigation with gentamicin versus povidone-iodine [8]. On the other hand, Borkhuu et al. reported on 220 children undergoing spinal fusion and found a four-fold reduction in SSI for those treated with gentamicin-impregnated bone allograft [9]. Han et al. retrospectively analyzed data from 399 patients undergoing spine surgery. Among patients who had a gentamicin-impregnated collagen sponge applied to their wound, the SSI rate was 0.8%, versus 5% for those treated without the sponge [10]. At this time, however, given the variability in reported application methods for local gentamicin and the small number of patients studied, the routine use of topical gentamicin cannot be recommended.

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