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QUESTION 4: Does the use of incise draping with antibacterial agents (iodine) influence the risk for subsequent surgical site infection/periprosthetic joint infection (SSI/PJI) in patients undergoing musculoskeletal tumor surgeries?

RECOMMENDATION: There is some evidence claiming that antimicrobial-impregnated incise drapes result in a reduction in bacterial contamination at the surgical site. However, there is little evidence to demonstrate that it results in a subsequent reduction in the incidence of SSI and/or PJI.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 100%, Disagree: 0%, Abstain: 0% (Unanimous, Strongest Consensus)

RATIONALE

Surgical incise drapes are often used by surgeons to reduce bacterial recolonization of the surgical site with host flora that may potentially predispose the patient to subsequent infection. Furthermore, it is important to differentiate antimicrobial-impregnated drapes from non-impregnated drapes as the addition of an antimicrobial agent, such as iodophor, may have a different effect on the rate of recolonization. The rationale behind the antimicrobial drape is that the incise drape can act as a physical barrier to block bacterial proliferation on the skin and potential entry into the surgical wound.

Multiple studies have demonstrated that incise drapes can result in a reduction in bacterial recolonization. In a prospective randomized controlled trial of 101 hips undergoing hip preservation surgery, Rezapoor et al. found that iodine-impregnated drapes resulted in a significant reduction (12.0% vs. 27.4%) in bacterial colonization compared to those without drapes [1]. Furthermore, Milandt et al. reported that the use of iodine-containing incision drapes did not increase bacterial recolonization in simulated total knee arthroplasty [2]. Dewan et al. reported that the use of an iodophor-impregnated plastic incise drape in abdominal surgery reduced the contamination of the wound [3]. Casey et al. evaluated the antimicrobial efficacy of an iodine-impregnated incise drape against methicillin-resistant *S. aureus* (MRSA) in a skin model and concluded that it had detectable antimicrobial activity [4].

While there is evidence to suggest that impregnated incise drapes result in a reduction of bacterial colonization, there is conflicting evidence demonstrating that impregnated incise drapes result in a significant decrease in the infection rate. Ritter et al. demonstrated a considerably low rate of SSI incidence (0.46%) in total arthroplasties performed with an antimicrobial incise drape [5]. In addition, Yoshimura et al. found that the lack of an iodophor-impregnated drape was a significant risk factor for wound infection after liver resection [6]. In contrast, a randomized study by Dewan et al. suggested that iodine-impregnated drapes did not result in a significant reduction in SSI rate in abdominal and cardiac surgery [3]. Furthermore, a randomized study by Segal and Anderson showed only a tendential reduction in the rate of SSIs by iodophor-impregnated adhesive drapes in high risk cardiac surgery [7]. Additionally, no SSIs were observed in a retrospective review of 581 patients undergoing anterior cervical fusions without iodophor-impregnated incision drapes. It was concluded that the use of iodophor-impregnated incision drapes during anterior cervical fusion was not needed [8].

In a Cochrane review of 3,082 patients, Webster et al. found that a higher proportion of patients developed surgical site infection with plastic drapes than patients in whom no drapes were used ($p = 0.03$) [9]. However, no difference was found when iodophor-impregnated drapes were used (rate ratio (RR) 1.03, 95% confidence interval (CI) 0.06 to 1.66, $p = 0.89$), which further highlights the importance of discriminating between antimicrobial and regular plastic incise drapes. In the World Health Organization guideline [10], four of the above-mentioned studies (one randomized-controlled trial (RCT) [7], one quasi-RCT [11] and two observational studies [6,12]) were identified that assessed the effect of using single-use adhesive incise drapes to reduce SSI. They commented that the two RCTs showed the use of antimicrobial-impregnated incise drapes may have some adverse effect, but the effect estimate was not statistically different from the control group. Furthermore, they noted that the observational studies reported that there may be a benefit in using antimicrobial-impregnated incise drapes, but the effect was not statistically different from the control group. They concluded that the quality of evidence for these comparisons was very low for both the randomized control trials and the observational studies due to the risk of bias and imprecision or inconsistency.

There is an extensive number of publications demonstrating that the use of antimicrobial-impregnated incise draping leads to a lower incidence of surgical site contamination. Studies demonstrating the beneficial effect of incise draping in reduction of surgical site infection, especially after tumor surgery, are lacking.

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QUESTION 5: Does the use of soft tissue attachment meshes increase the risk for subsequent periprosthetic joint infection (PJI) in patients undergoing oncologic endoprosthetic reconstruction?

RECOMMENDATION: The current literature indicates that there is no increased risk of PJI in this patient population with the use of soft tissue attachment meshes. However, there are few studies directly comparing the use of mesh vs. not using mesh in comparable tumors/surgical locations, so further comprehensive study on the topic is necessary to say with reasonable certainty that there is no connection.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 100%, Disagree: 0%, Abstain: 0% (Unanimous, Strongest Consensus)

RATIONALE

The reported infection incidence after tumor resection and replacement with an endoprosthesis varies widely in the literature, ranging from 7.8% to 25% [1–3]. Tumor type and surgical site have a significant influence on the infection incidence [3,4]. Despite the variation reported in the literature, the infection burden for these procedures is much greater than that of primary joint replacement surgery for which the infection rate of hips and knees is estimated at 1% [5].

Infection in endoprosthetic reconstruction cases has been attributed to multiple sources, one of which is the use of surgical mesh. Surgical mesh has been suggested to act as a vehicle for infection. This risk is increased when the mesh is used alongside a large implant or neoadjuvant chemotherapy. Henderson et al. investigated complication incidence in a series of 534 endoprosthetic failures and found that infection was the most common mode of failure [4]. Cho et al. examined risk factors related to infection in a cohort of 62 patients who underwent proximal tibial endoprosthetic reconstruction. Prostheses were removed due to infection in 25.8% of the patients; however, application of synthetic mesh to stabilize the patella was not found to be a significant risk factor, nor was chemotherapy [1]. A 2017 study investigated patient outcomes using BARD® mesh for endoprosthetic reconstruction and reported that only one case of deep infection and two cases of superficial infection developed out of 51 patients [6]. A systematic review of reconstruction techniques after resection of proximal humeral tumors found that megaprosthesis with mesh had an infection rate of 4%, which was between the rates of hemiarthroplasty (0%) and reverse shoulder arthroplasty (9%) [7].

Polyethylenterephtalate mesh, known as a Trevira® tube, is a mesh option used for endoprosthetic reconstruction. A 2001 study of 69 megaprostheses implants with Trevira tube for soft tissue reconstruction reported that there was no significant increase in the rate of infection compared to implantation without a Trevira tube [8]. Similarly, Maccauro et al. examined a cohort of 36 patients with solitary bone metastases who underwent resection and endoprosthetic reconstruction, of which 20 of the patients received a Trevira tube. They also detected no significant difference in infection rate between patients who did and did not receive a Trevira tube [9]. Additionally, Schmolders et al. determined that replacement of the proximal humerus using a Trevira tube in combination with a modular endoprosthesis is a safe and viable treatment option for both bone tumors and metastases. They observed no statistically significant increased risk of infection by using a Trevira tube, even among immunosuppressed patients [10].

Surgical meshes for reconstruction of abdominal wall hernias and groin region hernias have been successfully used since the 1940s [11]. While abdominal hernia repairs do not incur the additional