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

infection risks of endoprosthesis implantation and immunosuppressive effects of neoadjuvant therapy, patient outcomes using synthetic mesh for abdominal hernia repair have been well studied and provide some insight regarding infection rates associated with the use of mesh. A recent meta-analysis of 10 randomized controlled trials comparing abdominal hernia surgery outcomes using mesh vs. surgical suture detected no significant difference in infection rates between the 2 groups. However, the mesh group did demonstrate significantly lower incidence of recurrent hernia than the surgical suture group, leading the authors to conclude synthetic mesh was a highly efficacious repair technique [12].

In summary, the published literature suggested little or no association between the use of mesh for soft tissue attachment with endoprosthetic reimplantation and development of subsequent PJI. Further study is needed before it can be conclusively determined that the use of soft tissue attachment meshes does not increase the risk for subsequent infection in patients undergoing oncologic endoprosthetic reconstruction. Future investigation should utilize larger cohorts and control for tumor type and location so that the use of mesh can be better isolated as the variable of interest.

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QUESTION 6: Should endosprosthesis and/or allograft bone be soaked in antibiotic solution or antiseptic solutions prior to implantation in patients?

RESPONSE: Unknown. There is no evidence to suggest that the use of a pre-implantation antibiotic or antiseptic soak of an endoprosthesis or massive allograft would reduce the rate of surgical site infection/periprosthetic joint infection (SSI/PJI).

LEVEL OF EVIDENCE: Consensus

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

RATIONALE

In the oncologic literature, infection rates following metallic endoprostheses and bulk allograft surgery are high. In a systematic review, Henderson et al. found the rate of infection-related failure of endoprostheses to be 7.4%, when all anatomic locations were taken into account. Proximal tibia replacements and total femur replacements were noted to be at particular risk for infection, requiring revision surgery in 19.7% and 17.5% of cases, respectively [1]. In a systematic review of pediatric oncology patients, Groundland et al. found an infection rate of 12.9% and 17.1% when bulk osteoarticular allografts were used to reconstruct the distal femur and proximal tibia, respectively [2].

While not fully understood or rigorously investigated, the causes of these high rates of infection are likely multi-factorial, including extensive surgical dissections and resections, substantial blood loss, implantation of large constructs with foreign material and, in the case of oncology patients, a potentially immunosuppressed host.

Any measure that leads to decreased infection rates of metallic endoprosthesis and massive allograft reconstruction would be desirable. Given the prevalence of the problem and the severity of the consequences of deep infection, even weak evidence supporting a decrease in infection rates would be worth considering. While a few interventions have been noted to be beneficial, as reported in retrospective case series, no rigorous, prospective studies have been completed in this population [3–8]. Regarding the question above, there is no evidence to support or reject the use of a pre-implantation antiseptic soak of the endoprosthesis (or allograft). Local application of an antibiotic solution (e.g., gentamicin) around prosthesis before closing the incision in conjunction with a parenteral agent as antibiotic prophylaxis is routine practice in some institutions [9]. However, antibiotic solutions have been found to offer no advantage over saline in the removal of bacteria from bone, titanium or stainless steel. In addition, there