The Multiply Operated Patient: Last Resort Solutions

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Management of the patient who has failed multiple attempts at total knee arthroplasty (TKA) presents the surgeon with a difficult clinical decision to make. Patients may experience chronic infection, severe bone loss, soft-tissue compromise, or chronic pain. Although the choices for subsequent therapy are limited, the decision-making requires careful communication with the patient.

The multiply operated patient faces four choices: fusion, amputation, another attempted salvage operation, or continued conservative therapy. The factors that determine the right course of action for the patient and surgeon are based on patient medical factors such as age, health, and immune status. Patient and family expectations regarding the outcome of further therapy must also be considered. A realistic outcome assessment by the patient and surgeon is necessary if further attempted salvage is considered. Economic considerations regarding length of hospitalization and time lost from work may also influence the decision.

Infection

A typical clinical scenario that may force a nonarthroplasty solution is a failed two-stage revision TKA with persistent infection as indicated by significant pain or drainage, which may be further complicated by the effects of possible systemic sepsis. Inherent in this situation is the presumption that a thorough and complete debridement was accomplished at the initial treatment of the septic arthroplasty, and that proper intravenous antibiotic therapy was used for ≥6 weeks.

Salvage of the chronically infected TKA that has failed an aggressive two-stage intervention leaves the surgeon and patient facing fusion, amputation, or conservative therapy, which may include long-term oral suppressive antibiotic...
therapy.\(^1,2\) Frequently, long-term oral antibiotic therapy may not be available, depending on the sensitivity of the infecting organism and oral agent availability.

**Bone Loss**

Multiple attempts at revision TKA usually are associated with substantial tibial and femoral bone loss. Extensive bone loss may also occur following segmental replacement or salvage revision TKA. Extensive bone loss may make further knee salvage impossible or, at best, impractical. Such a situation may offer amputation as the only practical salvage procedure (Figure).

**Soft-Tissue Compromise**

Failed attempts at soft-tissue coverage of the knee may leave the surgeon with little to offer other than fusion or amputation, particularly in peripheral vascular disease. Occasionally, extremity fusion with the associated shortening resulting from femoral and tibial bone stock loss may allow wound closure and knee preservation. However, if this is not possible, amputation remains the only viable solution. Other situations that may require fusion or amputation include extensor mechanism rupture or chronic distal skin ulceration below a TKA in peripheral vascular disease.

**Chronic Pain**

The patient who presents with chronic pain following multiple knee surgeries is a poor candidate for further salvage. Other issues, such as secondary gain, depression, or substance abuse, may complicate evaluation of the pain syndrome. In the absence of a clear source for the patient’s pain, further surgical intervention is unlikely to yield a satisfactory outcome.

**Fusion of the Failed TKA**

Fusion of a failed TKA rarely produces a high level of patient satisfaction. Sitting is awkward following fusion. The average extremity shortening following fusion for failed TKA is approximately 3 inches.

Better results are obtained regarding ambulation when less shortening is present, suggesting that fusion performed earlier in a failed TKA (eg, in chronic infection) may yield a better functional result. The work of walking after knee fusion increases approximately 25% compared with a normal knee. This factor may be a significant consideration in the patient with limited pulmonary or cardiac function.

The greatest success with regard to knee arthrodesis in chronic infection occurs with intramedullary nail use\(^3-5\). However, persistent infection can occur in 10%-20% of cases despite aggressive antibiotic therapy. Other techniques for knee fusion such as external fixation or double plating have also been described, although with lower successful arthrodesis rates.

**Amputation After Failed TKA**

Amputation is occasionally indicated in overwhelming sepsis, chronic infection, or severe bone loss.\(^6\) Amputation following TKA is rare. In a series from the Mayo Clinic,\(^7\) amputation after TKA had a prevalence of 0.36% among 18,443 cases. In this series, 19 amputations were performed because of chronic infection, 42 for peripheral vascular disease, and the remainder for severe fracture, bone loss, or vascular injury. Only 5 of 9 patients fit with above-the-knee amputation prostheses ultimately achieved any ambulation.\(^7\)

Energy expenditure walking after an above-the-knee amputation is increased by approximately 35%. Oxygen consumption is increased approximately 50% compared to a normal patient, whereas walking efficiency is reduced by approximately 75%.\(^8\)

Above-the-knee amputees generally encounter the most difficulty in ambulation over steep, rough, or slippery terrain.\(^9\) Fear of falling and recurrent falls are particularly common among elderly patients with above-the-knee amputation.\(^10\) Given the difficulty in adapting to an above-the-knee prosthesis, amputation will not be well tolerated by the elderly or infirm patient. However, the procedure may occasionally be lifesaving in overwhelming sepsis, usually associated with compromise of the immune status.

**Conclusion**

Careful consideration of patient factors, and soft-tissue or bone loss factors, and a realistic assessment of the expected outcome of salvage surgery are necessary for the optimal outcome of these difficult cases. The patient and family must be involved in the decision-making process. Situations complicated by secondary gain issues or unrealistic expectations are unlikely to be successfully managed by heroic surgical measures.

**References**