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Review Article

Indications, Clinical Outcomes, and Complications of Resection Arthroplasty of the Knee: A Review

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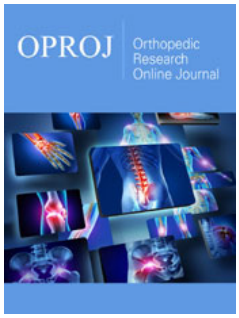

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Introduction

The field of knee arthroplasty encompasses a variety of techniques designed to address degenerative knee joint disease and deformity and restore functional capacity. One of the main clinical indications for knee arthroplasty is osteoarthritis (OA), a common degenerative joint disease associated with age, obesity, joint wear, and several other risk factors that results in pain and a progressive loss of function [1]. Knee OA involves the gradual degradation and loss of the articular cartilage, and in addition to pain, can result in varus or valgus deformity indicating surgical correction.

Resection-based techniques have been employed in knee arthroplasty for the treatment of OA as far back as the 1860s when Dr. W Ferguson et al. used the technique to enhance mobility and foster subchondral surface renewal [2]. Since then, advances in medical technology have rendered resection arthroplasty of the knee nearly obsolete as a definitive treatment of articular disease, instead used most frequently as the first of a two-stage revision process in the setting of failed Total Knee Arthroplasties (TKA) [3,4]. The modern procedure entails the removal of the articular surfaces of the knee, and any implanted devices, without any attempt at reconstruction, leaving behind a rudimentary fixation with pins or sutures [3]. While subsequent arthrodesis or Above-Knee Amputation (AKA) is common, resection knee arthroplasty has recently been afforded more contemporary exploration as a definitive treatment option [5].

Resection arthroplasty of the knee is most commonly indicated in severe, persistent Periprosthetic Joint Infection (PJI), most effective when limited to patients with low mobility demands as potential ambulatory sacrifices are great [4,6,7]. Although gold standard treatment would implicate a subsequent course of antibiotics and a second stage of surgery, resection arthroplasty alone can be quite effective in the treatment of patients not willing or able to undergo a full treatment regimen [6,8].

Currently, the literature surrounding resection arthroplasty of the knee is sparse as little consideration has been given as a viable treatment option. This review intends to explore resection arthroplasty in the context of modern treatment and its future use, with an emphasis on its indications and contraindications, outcomes, and complications.

Indications and contraindications

Due to limited contemporary literature, resection arthroplasty of the knee remains a relatively rarely performed procedure despite historically acceptable clinical and functional outcomes [3,6,9,10]. Today, resection arthroplasty is infrequently considered as one of several treatment modalities for the eradication of chronic Periprosthetic Joint Infection (PJI), a

serious complication seen in patients following primary or revision Total Knee Arthroplasty (TKA) [4,7]. PJI is a dreaded complication of TKA due to its impact on patients' function and quality of life, having shown associations with increased patient morbidity and mortality as well as economic repercussions [11-14]. PJI has an incidence of around 1-2% following primary TKA and is increased after revision surgery; these numbers are likely to rise in the coming decades due to expected increases in TKAs performed [15-17]. In cases of chronic, refractory PJI not amenable to revision TKA, knee salvage with knee fusion, Above-Knee Amputation (AKA), or less commonly resection arthroplasty is considered [5]. However, knee fusion is typically not a viable option in patients without sufficient bone stock and carries the risks of persistent pain and worsened quality of life [4,18,19]. Alternatively, while AKA offers definitive eradication of infection and is effective with limited bone stock, its psychological and functional implications, including increased depression, anxiety, and chronic pain, cannot be ignored [20,21]. In such situations of persistent infection, soft-tissue deficiency, bone loss, or several failed revisions, resection arthroplasty can be considered as a viable alternative option for knee salvage [22]. In comparison to other knee salvage procedures, resection arthroplasty promotes infection clearance, allows adequate flexion for sitting, and preserves the limb [4,5]. Of note, due to the risk of decreased ambulation and instability following resection knee arthroplasty, it can be a preferred treatment modality for patients already with severe preoperative disability, sedentary lifestyle, or multiarticular disease [5]. Additionally, aside from definitive treatment of PJI, resection arthroplasty can be employed as a staging procedure for future fusion, AKA, or prosthetic replacement [4,5,23].

Outcomes

Although there is limited literature on resection arthroplasty of the knee and its outcomes, existing studies show encouraging results of its efficacy for eradication of infection. In a study of 15 patients treated with resection arthroplasty for infected total knee replacements, Lettin et al. [10] reported no recurrence of infection in any patient. Similarly, Falahee et al. [9] performed 28 resection arthroplasties on 26 patients and recorded an 89% rate of infection eradication. More recent studies have shown similar results. Mine et al. [23] treated refractory infection post-TKA in 9 patients with resection arthroplasty combined with a muscle graft without infection recurrence. Comparably, Goldman et al. treated 25 knees in 23 patients with resection arthroplasty for PJI with an 84% infection clearance at most recent follow-up [4]. In regard to chronic pain, several studies reported decreases in pain or pain-free status in the majority of patients postoperatively [4,7,9,10,23].

While resection arthroplasty of the knee shows promise clinically, it yields mixed functional results. Due to instability associated with resection, patients often require postoperative support with a Knee-Ankle-Foot Orthosis (KAFO) and/or walking aid for maximum ambulation [4,5]. In the studies by Lettin and Falahee, all and 15 of 26 patients respectively could walk independently after resection, albeit with the support of a walking aid [9,10]. More recently performed studies suggest similar levels of functional capacity postoperatively. In Goldman's study, 45% of patients became community ambulators with the use of a cane or walker [4]. In terms of resection arthroplasty's efficacy as definitive treatment for PJI, contemporary studies suggest improvements in outcomes compared to earlier investigations. While 23% of patients in Falahee's study underwent secondary knee fusion due to knee instability, none of Goldman's patients who were infection free postoperatively elected for further knee salvage procedures [4,9]. Patient reported outcomes are similarly varied, with studies reporting dissatisfaction rates ranging from as low as 20% to as high as 39% [9,10,23].

Complications

As briefly mentioned earlier, the primary complications associated with resection arthroplasty of the knee are postoperative knee instability and refractory infection [4,5]. Both complications often necessitate further operation, including conversion to knee fusion or AKA. As such, when considering resection arthroplasty, it is critical for clinicians to discuss goals of care and expected outcomes with patients, especially concerning loss of ambulation and possible reinfection [22].

Conclusion

Resection arthroplasty of the knee is a viable option for treatment of recalcitrant PJI following primary or revision TKA. While other treatment modalities such as knee fusion and AKA exist, resection arthroplasty addresses certain downfalls of each and can be beneficial for the appropriate patient. Resection arthroplasty shows promise clinically with effective rates of infection eradication. However, it can result in middling functional outcomes with varied patient satisfaction. Therefore, proper patient selection is imperative when considering resection arthroplasty over other treatment options.

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