

Letter to the Editor

PAGET'S DISEASE AND KNEE ARTHROPLASTY

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Dear Editor,

Paget's disease (PD) is a chronic metabolic bone disorder characterized by abnormal bone remodeling. This letter reviews the impact of PD on knee joints and its implications for knee arthroplasty. The paper also discusses clinical considerations, surgical techniques, and outcomes associated with knee arthroplasty in patients with PD.

PD is a common skeletal disorder affecting primarily the elderly population. It is characterized by abnormal bone remodeling, leading to structurally compromised bone. While PD predominantly affects the spine, pelvis, and long bones, it can also involve weight-bearing joints, such as the knee (1). When knee involvement occurs, the condition may necessitate knee arthroplasty, which presents unique challenges due to the altered bone structure and increased vascularity associated with PD (2).

The prevalence of PD impacting knee arthroplasty varies geographically, with an estimated incidence of 3% to 4% in regions where the disease is more prevalent. Studies have shown that PD can significantly impact the need for knee arthroplasty due to bone deformities and degeneration in affected joints (3).

Prevalence and clinical features

PD is estimated to affect 2-3% of the population over the age of 50 in the United States (4). The clinical presentation of PD varies widely, ranging from asymptomatic cases to pain, deformities, and joint involvement (5). Knee involvement occurs in a substantial number of cases, necessitating surgical intervention (6). The clinical features of PD affecting knee arthroplasty are diverse. Patients may present with joint pain, swelling, and a limited range of motion. Furthermore, the altered bone architecture caused by PD may complicate the surgical process, potentially affecting implant stability and overall joint function post-arthroplasty. In PD, there is an increased number of osteoclasts, leading to excessive bone resorption, followed by disorganized bone formation (7). The affected bones become enlarged, weakened, and prone to deformity (8).

Diagnosis and treatment considerations

Diagnosing PD in the context of knee arthroplasty requires a comprehensive evaluation, including radiographic imaging, blood tests for biomarkers of bone turnover, and, in some cases, a bone biopsy for confirmation. Surgical planning should consider the altered bone structure, which may necessitate customized implants or specialized surgical techniques. PD frequently involves the long bones, including the femur and tibia, which can significantly impact the knee joint. As the disease progresses, affected bones might undergo deformities, leading to joint malalignment, increased stress, and osteoarthritis in the knee. Performing knee arthroplasty in PD patients requires careful preoperative planning. The altered bone architecture and increased vascularity pose challenges during surgery, potentially leading to excessive bleeding and difficulties in the fixation of implants. A comprehensive assessment of bone quality, deformities, and

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potential vascular changes in the affected bone must be performed. Adjustments in surgical technique to manage increased vascularity and potential bone hardness must also be considered; the surgeon should opt for implants suitable for altered bone density and structure.

The management of knee osteoarthritis in PD often involves total knee arthroplasty to alleviate pain and restore function (9). The altered bone quality in PD presents challenges in the preparation of the knee for arthroplasty (10).

Surgical planning must consider the increased vascularity, which can result in excessive bleeding during the procedure (11). Specialized surgical techniques may be required to manage the increased vascularity, such as the use of tourniquets and meticulous hemostasis (12). Intraoperative monitoring for bleeding and potential complications is crucial to the success of a procedure (13). The main challenges when performing total knee arthroplasty in the context of PD are malalignment (more commonly varus), extensive bone loss, soft tissue contractures, and thickening of the patellar tendon. With the steadily increasing number of total knee arthroplasties performed annually, it is reasonable to expect a proportional increase in the burden of PD cases. It is, therefore, important to employ a systematic approach to ensure optimal outcomes.

Pre-operative evaluation

Pre-operative evaluation is crucial in total knee arthroplasty for patients with PD. A comprehensive clinical assessment, including detailed medical history, imaging studies (such as X-rays and MRI), and bone scans, helps identify the extent and severity of bone involvement. Laboratory investigations for bone turnover markers, calcium levels, and alkaline phosphatase help assess disease activity. Consultation with a multidisciplinary team, including orthopedic surgeons, rheumatologists, and anesthesiologists, is pivotal for optimal pre-operative planning. Surgical planning in PD involves meticulous attention to bone quality, deformities, and potential complications. Customized implant selection, intraoperative imaging guidance (such as fluoroscopy), and alternative surgical approaches may be necessary to accommodate irregular bone morphology and maintain optimal joint alignment. The altered bone architecture in PD poses unique challenges during knee arthroplasty. Surgeons encounter difficulties in precise bone cuts and implant fixation due to the irregular and dense bone structure. Achieving proper alignment and stability becomes more intricate, potentially affecting the overall outcome of the surgery. During surgery, challenges may arise due to increased vascularity, cortical thickening, and altered bone density in PD. Careful bone preparation, modified instrumentation, and intra-operative assessment of bone quality are essential to prevent complications like excessive bleeding, implant malpositioning, and fractures (14).

Post-operative considerations

Post-operative care involves close monitoring for complications such as delayed wound healing, infection, and implant loosening. Physical therapy tailored to accommodate the patient's specific bone changes is essential for functional recovery. Bisphosphonate therapy should continue if disease activity is high (as measured using ALP levels) (15). The use of total knee arthroplasty can alleviate the functional limitations and pain associated with osteoarthritis in patients with PD. Post-operative pain relief and functional improvement appear to be significant and comparable to those of other patients. Surgeons treating this unique group of patients must be aware of the challenges and interventions necessary for optimal outcomes (16).

Outcomes and complications

Outcomes of knee arthroplasty in PD patients are generally positive in terms of pain relief and improved function. Complications may include infection, implant loosening, and periprosthetic fractures (17). Studies examining knee arthroplasty in PD patients show varying outcomes. Some research suggests that despite the challenges, arthroplasty can significantly improve functionality and reduce pain. However, the occurrence of complications is notably higher in comparison to arthroplasties in individuals without PD. Complications associated with knee arthroplasty in PD include implant loosening, fractures, infection, and limited implant longevity (18). The irregular bone structure can compromise the stability of the implant, leading to loosening over time. Due to increased bone density and altered architecture, there's a higher risk of intraoperative or postoperative fractures. In addition, the vascularity and altered bone metabolism associated with PD may increase the risk of infection in individuals after surgery. Abnormal bone turnover may affect the long-term success of the implant, potentially necessitating revision surgery. Addressing PD during knee arthroplasty requires a multidisciplinary approach. Preoperative planning, including advanced imaging and meticulous surgical techniques, is crucial to navigate the complexities associated with PD (19). Knee arthroplasty in patients with PD presents a unique set of challenges and risks. While it can offer substantial improvements in functionality and pain relief, the

increased likelihood of complications necessitates careful preoperative planning, precise surgical techniques, and vigilant postoperative care to optimize outcomes and minimize adverse events (20-22).

CONCLUSIONS

Knee involvement in PD presents a challenging disease. Although knee arthroplasty is often necessary to relieve pain and improve the quality of life in these patients, it requires specialized surgical techniques and vigilant perioperative management to address the altered bone quality and increased vascularity. While complications can occur, most patients experience significant improvements in pain and function following knee arthroplasty. Close collaboration between orthopedic surgeons and PD specialists is crucial for achieving successful outcomes in these cases.

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