Bilateral Extensor Mechanism Disruption After Total Knee Arthroplasty in Two Morbidly Obese Patients

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abstract

Disruption of the extensor mechanism as a result of patellar tendon or quadriceps tendon rupture is an uncommon but devastating complication after total knee arthroplasty. Treating a disrupted extensor mechanism can be challenging, particularly in patients who are morbidly obese, due to an increased risk of postoperative complications. Therefore, despite the debilitating nature of extensor mechanism disruption, many community surgeons do not feel comfortable pursuing more complex cases like revision total knee arthroplasty with extensor mechanism allograft on morbidly obese patients, and consequently many of these patients are referred to tertiary-care centers for reconstruction secondary to the complexity of this patient cohort. The authors report 2 cases of bilateral extensor mechanism disruption after total knee arthroplasty in patients who are morbidly obese. One patient experienced trauma leading to her initial rupture; however, her contralateral atraumatic disruption was subsequently diagnosed at a later date. The second patient did not experience trauma leading to either of her extensor mechanism disruptions. Despite substantial medical comorbidities and morbid obesity, revision total knee arthroplasties with extensor mechanism allografts were recommended in both cases in a staged bilateral fashion. The surgical technique is described and the unique challenges afforded by the marked obesity are detailed. The current literature on this subject is reviewed. Despite early complications related to recumbency, this report serves as an example of successful repairs of extensor mechanism disruptions in patients who are morbidly obese, suggesting that extensor mechanism allograft is viable even in patients with high risk of complications. [Orthopedics. 2015; 38(5):e443-e446.]
Extensor mechanism disruption is a rare complication after total knee arthroplasty (TKA)\textsuperscript{1-3} and its treatment requires complex reconstructive procedures that are associated with high complication rates.\textsuperscript{1,2,4} Morbidly obese patients undergoing such procedures can be especially difficult to treat.\textsuperscript{5}

Bilateral disruptions of the extensor mechanism are exceptionally uncommon injuries,\textsuperscript{6,7} and although cases have been reported,\textsuperscript{8} management in a patient who is morbidly obese has not been described.

The current authors present 2 cases of bilateral extensor mechanism disruption after primary TKA that was treated with staged extensor mechanism allograft (EMA) reconstructions in patients who are morbidly obese. A literature review is also provided regarding the challenges of managing such complications in patients with a body mass index (BMI) greater than 50 kg/m\textsuperscript{2}.

**Case Reports**

**Patient 1**

A 72-year-old woman presented with acute onset of right knee pain 11 years status post simultaneous bilateral TKA after falling from standing 1 month previously; she was subsequently unable to bear weight on her right leg. Medical comorbidities included morbid obesity (BMI, 58.9 kg/m\textsuperscript{2}), hypertension, and chronic obstructive pulmonary disease.

Passive range of motion (ROM) was 15\textdegree{} to 100\textdegree{}, and radiographs revealed a 4-pegged cruciate-retaining NexGen (Zimmer, Warsaw, Indiana) TKA in acceptable alignment with a posterior knee dislocation and patella alta (Figure 1A). A knee dislocation, gross multidirectional instability, and ruptured patellar tendon were diagnosed and treatment options were reviewed.

The patient underwent revision TKA using a rotating hinge knee system (Zimmer) with stemmed femoral and tibial components augmented with porous tantalum cones, as well as an EMA allograft reconstruction according to the successful technique described by Burnett et al.\textsuperscript{9} Postoperatively, she was placed in a long leg cast including the foot for 6 weeks with restricted ROM and weight bearing. During this time, she developed a full-thickness heel skin ulcer and was transferred into a locked hinged knee brace; wound care was initiated with antibiotics. Radiographs taken 6 weeks postoperatively (Figure 1B) showed good component alignment and allograft incorporation. She was then allowed weight bearing as tolerated in her locked knee brace, eventually progressing to unrestricted ROM; the brace was discharged at 12 weeks.

At 5-month follow-up, she was able to ambulate with her walker; ROM was 0\textdegree{} to 85\textdegree{}. However, at this time, she was unable to extend her contralateral knee. She denied any antecedent pain or trauma on that side. Radiographs revealed loosening of her left TKA components with a laterally dislocated patella and quadriceps tendon rupture (Figure 2A).

Eight months after her right knee revision surgery, the patient underwent revision of the left TKA with EMA in a similar manner to her right knee. Her postoperative course was uneventful except for a left heel ulcer that developed despite preventive measures. At latest follow-up (12 and 6 months postoperatively for the right and left sides, respectively), both knees were functioning well without complication and both heel ulcers had healed. Radiographs showed well-aligned bilateral revision TKAs with EMA reconstructions (Figure 2B).

**Patient 2**

A 49-year-old woman presented with bilateral knee pain 5 years status post...
simultaneous bilateral TKA. Two years previously, she underwent revision of her left knee for patellar tendon rupture and revision of her right knee for patellar component loosening, as well as extensor mechanism disruption. She stated that her knees had never felt good since either surgery.

Medical comorbidities included morbid obesity (BMI, 50.2 kg/m²), hypertension, diabetes mellitus, and rheumatoid arthritis. Right knee passive ROM was 20° to 105° and was stable in all ligaments. Left knee passive ROM was 20° to 105° with increased anterior-posterior ligamentous laxity. Radiographs revealed patella alta in both knees, as well as an unhealed inferior right pole fracture (Figure 3A). Bilateral ruptured patellar tendons and multidirectional knee instability were diagnosed.

The patient underwent right revision TKA with EMA using an identical procedure to that of the first patient. Postoperatively, she developed a full-thickness heel skin ulcer while in her long leg cast (despite weekly cast changes) and was then transferred into a locked HKB with wound care and began taking antibiotics. At 6 weeks postoperatively, radiographs showed good component alignment and allograft incorporation (Figure 3B). She was allowed weight bearing as tolerated in her locked HKB, eventually progressing to unrestricted ROM; the brace was discharged at 12 weeks. At 8-month follow-up, the patient’s right knee was functioning well; she was able to ambulate with her walker with a ROM of 10° to 110°. Her heel ulcer had healed by her next appointment 6 months later.

At her most recent follow-up, 2 years after her right-sided revision, the patient reported pain in her right knee for the previous month. Physical examination showed no ligamentous instability, and radiographs showed the TKA components in acceptable alignment. The authors discussed with her that her pain could have been attributed to her overall deconditioned state and recommended physical therapy to strengthen and stretch her quadriceps and hamstrings. Her left-sided EMA revision continues to be delayed until she is ready to move forward.

**DISCUSSION**

Unilateral disruption of the extensor mechanism is a rare complication after TKA, with estimates as low as 1%. Bilateral extensor mechanism disruption has been reported after bilateral TKA, but to the authors’ knowledge has not been reported in a morbidly obese patient.

Several etiologies have been suggested for patellar and quadriceps tendon rupture after TKA, including direct trauma, repetitive microtrauma, operative measures, systemic disease, steroid use, increased body weight, and sedentary lifestyle. Bilateral extensor mechanism disruptions have been more commonly observed in cases of chronic systemic disease and steroid use. Unfortunately, these etiologies remain largely speculative given the small number of cases reported.

Treatment options for disrupted extensor mechanism include direct surgical repair, reconstruction, and knee arthrodesis, which is seen as a last-resort treatment. Direct surgical repair has been associated with failure rates greater than 90%, but EMA reconstruction has proven to be a more successful technique, with recent studies reporting 100% patient satisfaction and successful tissue incorporation.

Reconstruction with allograft is usually considered in cases where deficiencies in the extensor mechanism would make successful repair difficult. Whole EMAs are most commonly used when sufficient patellar bone is lacking or the patella cannot be moved close enough to the joint line. Revision TKAs were indicated in both of the current cases due to ligament instability and for protection of the integrity of the EMA implant.

Despite the debilitating nature of extensor mechanism disruption, many community surgeons do not feel comfortable pursuing more complex cases like revision TKA with EMA for patients who are morbidly obese because they have increased odds of developing myriad complications. Other comorbidities (hypertension, chronic obstructive pulmonary disease, and obstructive sleep apnea) have been associated with increased risk of complications after TKA as well.

Postoperative care in patients who are morbidly obese undergoing TKA or EMA presents unique challenges, such as difficulty in achieving proper casting alignment and the development of skin uncompromised healing. It is often impossible to obtain this level of immobilization in the obesity population. The use of customized casts is helpful in providing adequate immobilization and protection of the patellar implant.

**Figure 3:** Anteroposterior radiograph revealing bilateral patella alta, as well as an unhealed inferior right pole fracture (A). Bilateral ruptured patellar tendons were diagnosed. Mediolateral radiograph of the right knee taken 6 weeks postoperatively showing good component alignment and allograft incorporation (B).

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**References**

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3. Reconstruction with allograft is usually considered in cases where deficiencies in the extensor mechanism would make successful repair difficult. Whole EMAs are most commonly used when sufficient patellar bone is lacking or the patella cannot be moved close enough to the joint line. Revision TKAs were indicated in both of the current cases due to ligament instability and for protection of the integrity of the EMA implant.

4. Despite the debilitating nature of extensor mechanism disruption, many community surgeons do not feel comfortable pursuing more complex cases like revision TKA with EMA for patients who are morbidly obese because they have increased odds of developing myriad complications. Other comorbidities (hypertension, chronic obstructive pulmonary disease, and obstructive sleep apnea) have been associated with increased risk of complications after TKA as well.

5. Postoperative care in patients who are morbidly obese undergoing TKA or EMA presents unique challenges, such as difficulty in achieving proper casting alignment and the development of skin uncompromised healing. It is often impossible to obtain this level of immobilization in the obesity population. The use of customized casts is helpful in providing adequate immobilization and protection of the patellar implant.

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**Figure 3:** Anteroposterior radiograph revealing bilateral patella alta, as well as an unhealed inferior right pole fracture (A). Bilateral ruptured patellar tendons were diagnosed. Mediolateral radiograph of the right knee taken 6 weeks postoperatively showing good component alignment and allograft incorporation (B).
ulcers in areas that have been subjected to unrelieved pressure and areas susceptible to fungal infections\(^\text{15}\) (eg, the full leg casts in the current cases).

Despite early complications, including the development of heel ulcers, both patients experienced desirable outcomes. The second patient’s recent knee pain can be attributed to several patient factors. The authors suggest that even complex procedures such as bilateral revision TKA with EMA reconstruction can be considered in the most obese of patients.

To the authors’ knowledge, these are the first 2 reported cases of bilateral extensor mechanism disruption after bilateral TKA in patients who are morbidly obese. Furthermore, this report serves as an example of 2 successful repairs of an extremely rare injury, and the authors suggest that EMA is viable even in patients with a high risk of complications. However, surgeons must be aware of the challenges associated with caring for patients who are obese in such complex cases. Casts require frequent changes and padding around the Achilles tendon (for cylinder casts) and the heel (for long leg casts) must be optimized.

**REFERENCES**