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Unusual Severe Soft Tissue Necrosis Following Exposure of Metal Implants in Total Knee Replacement: A Case Report

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ABSTRACT

Introduction: *Complications, such as thromboembolism, infection, periprosthetic fracture, and soft-tissue necrosis are commonly encountered in cases of total knee arthroplasty. The risk of developing complications is higher in patients with comorbidities, including diabetes mellitus (DM) and hypertension. Soft tissue necrosis can be managed through local wound care, frequent dressing change, surgical debridement, and tissue flap accordingly.* ***Case report:*** *In this report, we describe the case of an obese, 65-year-old bed-ridden female, a known case of hypertension, DM and hypothyroidism with stable vital signs. She underwent bilateral total knee replacement for severe osteoarthritis of her knees. During the 8th week post-operatively of her left knee, the patient developed sloughing of the wound and was admitted through the emergency under orthopedic care. She was diagnosed with soft tissue necrosis and treated with irrigation and debridement. She also administered a course of intravenous antibiotics. During her hospitalization, the orthopedic and plastic surgery teams were involved and the patient underwent multiple irrigation and debridement and implant removal followed by coverage of the wound with a partial thickness skin graft.* ***Conclusion:*** *Extensive antibiotics course, multiple irrigation and debridement, and arthrodesis over a period of less than 3 months has successfully salvaged the patient's limb.*

Keywords: Total knee replacement, Tissue necrosis, Complication, Osteoarthritis

INTRODUCTION

Around 478,000 knee replacements are conducted every year in the United States, most of which have successful outcomes [1]. Arthritic knees are common in the older age groups where the patients are more likely to have comorbidities that can affect the post-operative outcome [2]. Patients with diseases, such as diabetes mellitus, rheumatoid arthritis, and renal failure, are more susceptible as they have higher risk of complications, such as thromboembolism, infection, periprosthetic fracture, neurovascular injury, periprosthetic loosening, instability/dislocation, and stiffness [3,4].

Another complication following total knee replacement is soft-tissue defect and necrosis, the management of which depends on the size and depth of the wound, amount of viable soft tissue, presence or absence of infection, visibility of the prosthetic components, and patient factors, such as obesity, diabetes mellitus [DM], and smoking [5]. Soft tissue defects after total knee arthroplasty (TKA) are major complications that might result in loss of the prosthesis or limb [6].

The exact cause of this complication is not known; however, there are some reports of patients developing sensitivity towards the metal used in the procedure, which resulted in the soft tissue defect [7]. The treatment options of the soft tissue defect include local wound care of the necrosed tissue over the patellar tendon and tibial tubercle, frequent dressing change, surgical debridement, and flap depending on the extent of the defect [8,9].

Case History

A 65-year-old female, who was a known case of hypertension under treatment with amlodipine 5 ml, DM on Glucophage 500 ml BID, Glyburide 1.25-20 mg PO daily, and hypothyroidism (100 mg thyroxin) was bedridden

owing to osteoarthritis, presented with severe left knee pain (rating 8/10) on the pain scoring system (numeric rating scale) that limited her mobility [10]. She was not present with fever or weight loss or specific aggravating factors. The pain reportedly was not relived by medications (analgesics).

She had a past surgical history of total 6 months of right knee replacement with no complications, before she was presented to our hospital 2 months after her left knee replacement. She had an unremarkable family history.

Written informed consent had been obtained from the patient for possible infections, complications and bleeding and was admitted to the hospital. On examination, the skin showed no signs of inflammation, ulcers, or swelling. There was no tenderness on palpation. The range of motion was from 0°-95°. Distal neurovascular examination was intact. Examination of the other systems was not remarkable.

Deep vein thrombosis (DVT) was ruled out using Doppler ultrasound. On the night of surgery the patient was on proper insulin protocol and sliding scale. She underwent the right TKA (post stabilization after she received 1g of Cefazolin IV). The total blood loss was 30 cc. The wound was approximated without significant tension on the wound edges. Clips were used to close the skin and no drain was inserted. Knee immobilization was done immediately after the surgery.

The patient was sent to the ward to achieve hemodynamic stability and for treatment of intra operative complications. In the ward she was administered with cefazolin 1.5g IV for 48 hour, analgesics in form of paracetamol 1g IV for q8hr and pethidine 50 mg intramuscular q8hr PRN (as needed) for pain also, tramadol (50 PO q8hr).

She was admitted for 5 days for wound dressing and it was done on the 2nd day. The wound appeared benign with no signs of discharge or soft tissue necrosis. The patient was on continuous passive motion (CPM) on post-operative 2nd day. The patient was mobilized out of bed on the 3rd day post-operatively and discharged on post-operative 5th day.

At the time of discharge, she was able to actively flex the knee to 100°. The wound appeared benign. She was afebrile and was discharged with the following instructions:

- Exercise 5 times weekly (hamstrings and quadriceps strengthening exercise)
- Clexane 40 mg SC for 40 days and every other day sterile dressing in a local hospital near her house
- She was given an appointment after 2-weeks in the wound care clinic for removal of the clips
- Review at 6 week in the arthroplasty clinic

She went home and was doing fine until 8th week post operatively, when the wound appeared to be sloughed out starting from the edges. She was re-admitted in the ER with an initial diagnosis of soft tissue necrosis. Subsequently, she was transferred to the operation room for irrigation and debridement. The wound was closed without tension and she was administered antibiotics (Cefazolin 1.5g IV for 48 hr). On the 3rd day post irrigation and debridement, the wound appeared to be sloughed out again as shown in Figure 1.

Figure 1 Shows extensive soft tissue necrosis post TKR

Patient was transferred to a tertiary care center and the plastic surgery and orthopedic team decided to admit the patient and the patient was advised to undergo an orthopedic intervention, including removal of the implants (and irrigation) and possible grafting after healing and negative culture.

The patient underwent the procedure (bone culture). In the first 7 days the culture appears negative (no growth). On 8th day, it demonstrated growth of MDRA *Staphylococcus aureus*. The infectious diseases team suggested administration of meropenem 500 mg IV q8hr for 6-weeks. During this time the patient was evaluated by orthopedic team every other day (WBS: 40.6 × 10^9/L, ESR: 806 mm/hr, CRP: 186 mg/L).

She was on vacuum assistant closure for 5-weeks. When the patient completed the recommended antibiotic course change in parameters was noted (ESR: 8 mm/hr, WBC: 9 × 10^9/L). The decision was made by the orthopedic team to perform knee arthrodesis as shown in Figure 2.

Figure 2 Following multiple irrigation and debridement and wound closure

It was also decided by the plastic surgery team to perform grafting for the patient. The patient received a partial thickness skin graft from the right thigh and the graft was able to close the defect effectively as shown in Figure 3.

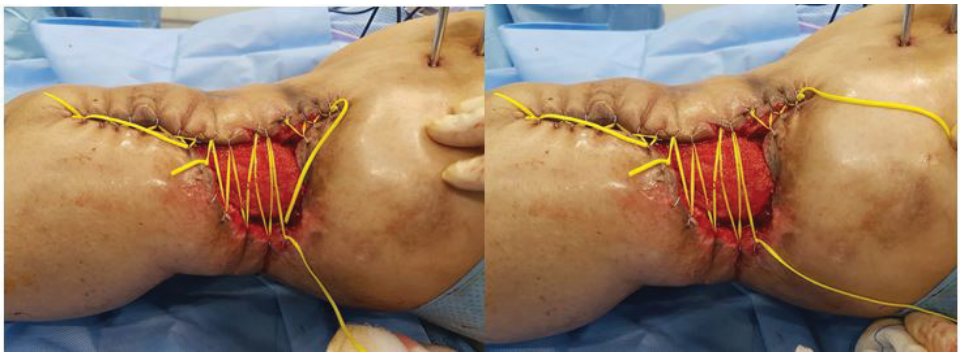

Figure 3 Skin grafting by the plastic surgery team

The patient was admitted for 3 weeks and during this time she was administered with cefazolin 1g BID IV. The wound was dressed on 3rd day post operatively and it appeared healthy without any signs of skin necrosis or discharge.

At the time of discharge the wound was dry, without discharge and completely closed without necrosis. She was discharged and instructed to get the wound dressed daily at the wound care clinic in the hospital.

The patient was reviewed in the arthroplasty clinic 6-weeks after the soft tissue closure and knee arthrodesis. At this time, the wound appeared closed without any significant complications.

The patient was scheduled for external fixation removal 3-months after the last procedure. At that time, no discharge or skin necrosis was seen on the wound and Ex-Fix was removed easily. The patient was reviewed 2 weeks later and the wound showed no signs of infection (Figure 4).

Figure 4 The wound shows no signs of discharge, swelling, or skin necrosis

DISCUSSION

The soft tissue defect in osteoarthritis cases after TKA has been associated with multiple comorbidities and not enough literature is available discussing the options for optimal management, which could vary between conservative management for removal or replacement of the prosthesis or use of skin graft. In a previous study, 8 of 17 cases with osteoarthritis underwent TKA, and *Staphylococcus aureus* was the most common organism identified followed by *Pseudomonas aeruginosa*, with a mean defect range varying between 3 × 7 cm^2 to 11 × 10 cm^2 and an average duration of 20 months. Most of the cases were managed using a fasciocutaneous flap as the primary procedure and medial gastrocnemius flap as the secondary procedure [6]. In our case although deep structures were involved, skin grafting from the right thigh effectively improved the wound after a follow up duration of 3 months. Most of the early and superficial infections present with signs of inflammation within 3 months were self-limiting and were resolved with oral antibiotics; however, deeper infection several months after the primary surgery could present with abscess or discharging sinuses [11]. Our patient demonstrated no signs of early inflammation in the first 2 weeks post operatively but showed sloughing of the soft tissue within <3 months, despite the appropriate dressing technique.

During preoperative check-up, comorbidities, such as obesity and diabetes must be considered as significant risk factors for surgical site infection “SSI”. Obesity is associated with an infection rate of 8.96%, higher prosthetic dislocation, need for revision, and risk of thromboembolism has been documented [12]. Although DM is considered a higher risk in THA, our patient was a controlled diabetic and showed no signs of disease progression or end organ damage preoperatively [13].

Using a program to identify the risk for complication after TKA can limit the recurrence of infection, reduce hospital stay, and improve hospital plan of care [2]. A previous case report documented necrotizing fasciitis after elective TKA and showed an association with the risks mentioned above, with severe tissue necrosis and defect that can lead to amputation. The optimal treatment for this is the extensive IV antibiotics course prior obtaining the culture results [14].

CONCLUSION

In conclusion, this case had severe unusual soft tissue necrosis. That needed extensive antibiotics course, multiple irrigation and debridement, and arthrodesis successfully saved the patient limb within duration of less than 3 months.

DECLARATIONS

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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