



Wound Issues after Total Knee Arthroplasty

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ABSTRACT

Wound healing problems following total knee arthroplasty (TKA) are infrequent, but if present may lead to devastating results. Occurrence may be minimized by modifying patient risk factors, proper selection of skin incisions, and using operative techniques that protect soft tissues. When wound complications arise, prompt management is imperative to assure the best outcome after TKA.

Keywords: Total knee arthroplasty, Wound healing, Wound complications.

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INTRODUCTION

Primary wound healing after total knee arthroplasty (TKA) is crucial to assure satisfactory outcomes. This review will focus on preventative measures, diagnosis and treatment of wound-healing complications.

PATIENT RISK FACTORS

Achieving optimum preoperative nutrition is essential to decrease the incidence of postoperative wound complications.¹⁻³ Ideal nutritional values include a total lymphocyte count > 1500 cells/ μ l, albumin > 3.5 gm/dl, and transferrin levels > 200 mg/dl.^{1,2,4} Low serum zinc has been implicated in poor wound healing after hemiarthroplasty but has yet to be studied in patients undergoing TKA.⁵ Correction of preoperative abnormalities is recommended prior to proceeding with an elective primary or revision TKA.

The importance of morbid obesity is debated as an independent risk factor for complications after TKA since it is rarely seen as an isolated diagnosis. However, a recent study demonstrated morbid obesity is an independent risk factor for wound dehiscence.⁶ Obesity creates exposure difficulties necessitating more vigorous retraction of skin flaps and the subsequent risk of soft tissue devascularization. Despite patients being overweight, many patients have significant nutritional deficiencies preoperatively and typically will benefit from dietary consultation in conjunction with a weight loss program to diminish the risk of postoperative complications. Bariatric surgery may be considered in select patients and has been shown to decrease the rate of wound-healing complications in this population.⁷

Biologic agents have significantly reduced joint destruction in patients with inflammatory arthritis but at the expense of potential wound-healing complications. Recommendations regarding discontinuing these medications in the perioperative period are conflicting. Currently, the American College of Rheumatology recommends discontinuing these agents at least 1 week prior to surgery, with the possibility of an earlier preoperative cessation determined by the pharmacokinetic half-life of the medication in question. These medications may be restarted safely 2 weeks following TKA after the wound has healed.⁸ Continued use of methotrexate and hydroxychloroquine in the perioperative period has been shown to be safe in most reports.⁹⁻¹¹ Although corticosteroid use can decrease wound tensile strength, patients who take corticosteroids chronically are encouraged to continue these medications during the perioperative period due to their effect on the adrenal axis. Stress dose steroids may be required to prevent adrenal insufficiency in these patients.¹²

The deleterious effect of tobacco use on wound healing is related to systemic vasoconstriction from nicotine.¹³⁻¹⁸ Perioperative smoking cessation is an effective strategy in reducing this complication.¹⁹⁻²¹ The benefits of cessation are maximized when started at least 4 to 8 weeks preoperatively.¹⁹⁻²¹

The method of thromboembolism prophylaxis may create wound-healing issues.²² Excessive bleeding from anticoagulant use increases wound tension, risks prolonged wound drainage leading to subsequent risk of infection, and can limit TKA flexion. In patients with a high risk of wound complications, mechanical prophylaxis in combination with a less potent chemoprophylaxis has been advocated.²³

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Other factors associated with wound-healing complications postoperatively include, but are not limited to, diabetes (mean postoperative blood glucose of >200 mg/dl or a preoperative hemoglobin A1C level of >6.7%),²⁴ perioperative chemotherapy, a history of prior irradiation to the surgical site, and burns over the anterior perincisional region. Additionally, continuous passive motion (CPM) beyond 40° has been shown to reduce transcutaneous oxygen tension at wound edges particularly the first 3 days after TKA. Continuous passive motion use should therefore be limited in the at risk patient.²⁵

The above-modifiable risk factors have been discussed individually, but many patients will present with multiple in combination. Identification and management of these risk factors is essential to diminish the incidence of wound-healing complications.

INTRAOPERATIVE MANAGEMENT

Vascular anatomy about the knee suggests that choice of a midline skin incision is least disruptive to the arterial network. When previous skin incisions are encountered, selection of the most appropriate incision may diminish the risk-associated skin healing complications. Ignoring short medial or lateral peripatellar incisions is usually safe. In addition, placement of a longitudinal incision through a previously used transverse incision typically will not cause a problem. If long parallel skin incisions exist, select the most lateral usable incision to access the knee joint. Undermining of skin flaps should be minimized, particularly laterally. If elevation of skin flaps is required dissection deep to the subcutaneous fascia to preserve the perforating arteriolar network between the subcutaneous fascia and dermal plexus is essential. In complex situations, a preoperative plastic surgery consultation may be warranted.

Soft-tissue expansion techniques have been successfully described in cases of contracted soft tissues from prior incisions, burns or irradiation.²⁶⁻³¹ This technique involves subcutaneous implantation of an expandable reservoir in which saline is intermittently injected to expand the surface area of the skin. Complications of this procedure, although rare, include hematoma formation, reservoir deflation, infection and skin necrosis from vigorous tissue expansion.³² Disadvantages are the need for an additional procedure and the time required for expansion prior to TKA.

WOUND COMPLICATION MANAGEMENT

Wound complications may range from a nondraining hematoma to full-thickness soft tissue necrosis in which components are exposed. Each wound problem creates a

specific challenge, and prompt recognition and treatment is imperative.

Nondraining Hematoma

Scientific data are lacking to clearly support surgical drainage rather than observation of the nondraining hematoma. We treat the nondraining hematoma with observation as long as no signs of infection or impending skin necrosis from excessive soft tissue tension are present. Occasionally, needle aspiration is attempted in the clinic and may be successful in selective patients. If formal evacuation procedures are entertained, they should be performed in the operative theater with appropriate perioperative antibiotic therapy.

Prolonged Drainage

We manage substantial drainage from the incision in the first 3 days with lower limb immobilization in extension and application of a compressive dressing. The use of negative pressure wound vacuum therapy (NPWT) may be utilized in selective situations as well. If drainage persists beyond 5 to 7 days, spontaneous cessation of drainage is unlikely and surgical debridement is indicated to decrease the risk of subsequent periprosthetic infection.^{33,34}

Superficial Soft Tissue Necrosis

Small necrotic areas less than 3 cm in diameter may heal with local wound care or delayed secondary closure. Larger areas of superficial necrosis should be debrided and covered with split-thickness skin grafting or fasciocutaneous flaps.³⁵⁻³⁷ NPWT may serve as an adjunct to treatment and may suppress bacterial overgrowth. Wounds that do not show clinical improvement within several days require additional operative intervention.

Full-Thickness Soft Tissue Necrosis

Full-thickness soft tissue necrosis may be associated with exposed prosthetic components and requires immediate, aggressive debridement. Various types of flaps have been described, including fasciocutaneous,^{35,36} myocutaneous³⁸⁻⁴⁴ and myotendinous.⁴⁵ Delayed wound closure should not be attempted as it has been shown to have dismal results.³⁸ Occasionally, lateral gastrocnemius flap coverage is required (Figs 1 and 2), but the medial gastrocnemius flap remains the workhorse of reconstruction and excellent results have been reported with this technique.⁴⁶ Aggressive debridement, synovectomy and removal of nonviable tissue should be the goal of treatment in addition to soft-tissue coverage.



Fig. 1: Lateral soft-tissue defect (post-debridement) with exposed components requiring lateral head of gastrocnemius muscle flap for soft-tissue coverage (Courtesy: Conrad Tierre, MD)



Fig. 2: Intraoperative photograph of a lateral head of the gastrocnemius muscle flap for reconstruction (Courtesy: Conrad Tierre, MD)

Antibiotic Use

Parenteral antibiotics are often required in cases with persistent drainage and wound necrosis, but should not be used indiscriminately. Unnecessary use of antibiotics risks alteration of bacterial flora and sensitivities should deep infection occur. Joint aspiration for culture is suggested before initiation of antibiotic therapy to maximize culture results. The thresholds in the acute post-operative period (within 6 weeks of surgery) are higher with synovial white blood cell and polymorphonuclear cell percentage cutoffs being as high as 27,800 and 89% respectively.⁴⁷ Lastly, cultures of superficial drainage are often spurious, with little correlation with deep infecting organisms.⁴⁸

SUMMARY

Wound issues following TKA are a dreaded complication that may significantly affect outcomes. These problems may be minimized through a proactive approach including modification of patient risk factors, proper choice of skin incisions, gentle handling of soft tissues,

meticulous hemostasis and wound closure without excessive tension. Should wound problems occur, prompt recognition and management is vital to assure a satisfactory outcome.

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