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Surgical technique

Alternative technique for knee manipulation under anesthesia

Kelli S. Baum, DO *, Tianyi D. Luo, MD, Shea Comadoll, MS, Anthony Marois, MS, Maxwell Langfitt, MD, John Shields, MD

Wake Forest Baptist Hospital, Winston-Salem, NC, USA

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ABSTRACT

Total knee arthroplasty is a successful surgery for the majority of patients with osteoarthrosis of the knee. Approximately 5% of patients undergoing total knee arthroplasty experience loss of motion or arthrofibrosis. Manipulation under anesthesia (MUA) is generally indicated for patients who do not achieve >90° of flexion by 6-12 weeks postoperatively. Complications from MUA are rare but can be devastating. We describe a novel technique for MUA with no reported major complications in our review of 78 patients. The average flexion improved from 80.0 (±3.8) before manipulation to 115.4 (±2.1) after manipulation. There were no major complications including fracture or extensor mechanism injury.

Introduction

Total knee arthroplasty (TKA) is a successful surgery for the majority of patients with osteoarthrosis of the knee. Approximately 5% of patients undergoing TKA experience loss of motion or arthrofibrosis. Manipulation under anesthesia (MUA) is generally indicated for patients who do not achieve >90° of flexion by 6-12 weeks postoperatively [1]. Outcomes in both range of motion (ROM) and function following MUA have been shown to be similar to outcomes following TKA not requiring MUA [2]. In most patients who undergo MUA, approximately 30 degrees of increased ROM can be expected [3-5]. Complications from MUA are rare but can be devastating. These most commonly are loss of motion or need for revision surgery [6]. Less frequent complications include fracture, hemarthrosis, and extensor mechanism injury. Traditionally, MUA is performed by applying gentle pressure to the proximal tibia with progressive flexion as scar tissue is broken up [1]. Our technique was initially described in a case report by Smith et al [7] in 1999 where they describe a novel technique for knee manipulation that resulted in a trend toward decreased complications with no supracondylar femur fractures reported. They did not, however, quantify motion regained and maintained with this method. We describe this technique in detail with brief statistical outcomes in addition to an instructional Video.

Surgical technique

At our institution, patients requiring knee MUA undergo appropriate preoperative clearance and consent. When completed, patients are admitted to the preanesthesia area where a short acting spinal anesthetic and light sedation are administered. With adequate analgesia and the patient in the supine position, the affected knee is first checked for premanipulation flexion and extension. The hip is then flexed to 90° and the distal thigh held by the surgeon so that the knee is able to flex with the weight of gravity. A gentle flexion and extension of the hip is then initiated allowing the lower leg to freely flex and extend against gravity. This motion is increased so that the lower leg motion increases. The weight of the lower leg with this motion generates the force necessary to break up scar tissue and restore motion. A light pressure can be applied to the upper tibia to push the knee into greater degrees of flexion if desired. Force applied to the ankle or foot is avoided with this procedure. After manipulation all patients received anteroposterior and lateral radiographs to verify no complications. Patients are then able to weight bear as tolerated

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* Corresponding author. 1 Medical Center Blvd, Winston-Salem, NC 27157, USA. Tel.: +1 503 516 3193.
E-mail address: kelli.s.baum@gmail.com

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and initiate immediate outpatient physical therapy in order to maintain motion after manipulation.

Postoperatively, patients are discharged home when they have recovered from anesthesia and are cleared by physical therapy for safe return to home. Immediate outpatient physical therapy is initiated and the majority of patients requiring MUA are given continuous passive motion machine for home use. Patients are followed up after manipulation at 2 weeks, 6 weeks, 3 months, and 1 year.

Outcomes

We reviewed 78 patients (29 male and 49 female) who underwent MUA between 2011 and 2016 using this technique. Mean age at the time of MUA was 61.4 years (±9.0). The majority of patients requiring MUA had primary TKA as the index procedure (69/78). Of the remaining patients, 5 patients had a revision TKA and 4 had a unicompartmental knee replacement prior to manipulation. The average time from TKA to MUA was 60.2 days (±22.9 days). A total of 5 complications (6.4%) were observed. Two patients had ongoing stiffness and required repeat MUA, 2 patients required revision total knee for continued stiffness, and 1 patient had a thigh hematoma and continued stiffness. There were no reported fractures or extensor mechanism disruptions. Evaluation of ROM (Table 1) demonstrated that knee extension remained unchanged from pre-MUA to post-MUA (3.2 ± 0.8 to 2.9 ± 0.8), but that significant improvement in flexion was achieved (80.0 ± 3.8 to 115.4 ± 2.1, $P < .001$). At 1 year follow-up, 52 of 78 (67%) patients had ROM data available. Flexion remained significantly improved compared to pre-MUA (80.0° ± 3.8° vs 101.4° ± 3.8°, range 80°-130°).

Table 1
Range of motion data (mean ± standard error).

Time from MUA	Extension	Flexion
Pre-MUA	3.2 ± 0.8	80.0 ± 3.8
Post-MUA	2.9 ± 0.8	115.4 ± 2.1
Six weeks post-MUA	2.3 ± 0.9	101.9 ± 3.1
Twelve weeks post-MUA	0.6 ± 0.6	103.9 ± 4.2
One year post-MUA	0.8 ± 0.6	101.4 ± 3.8

Discussion

Arthrofibrosis is a rare complication following TKA. When this occurs, MUA is a successful treatment option in the majority of patients to restore motion. Our described technique is a safe alternative to the traditional method for MUA with similar outcomes and no reported major complications. Our series of patients is not large enough to determine statistical decrease in complication rate. However, in the original description by Smith et al [7], their series of 51 manipulations using this technique trended toward a decrease in complication rate, but it did not reach significance ($P = .47$). Other studies of similar sample size describe at least one supracondylar femur fracture in their series [4,5]. With this technique, we are able to restore ROM equivalent to that achieved using traditional techniques with a low complication rate and no report of supracondylar fractures [2,4,5]. All complications observed were related to continued stiffness (5/78, 6.4%). The remaining 93.6% of patients had improvement in ROM with this technique which is consistent with the findings of Keating et al [4], who found a 90% improvement in knee flexion after manipulation. Similarly, Namba and Inacio [8] reviewed 195 patients requiring MUA and found that 6.7% required revision surgery after manipulation. The authors using this technique do not perform late manipulations for stiffness and no patients in this review underwent manipulation past 83.1 days, therefore we cannot comment on its effectiveness for late manipulations. However, there are data to support the effectiveness of late manipulations which this technique would be applicable to [8].

Summary

This alternative method to knee MUA is a safe and effective technique with no reported major complications.

Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.artd.2017.07.006

References

[1] Levine B, Rosenberg A. Chapter 15: Manipulation under anesthesia. Techniques in revision hip and knee arthroplasty. Philadelphia (PA): Elsevier Saunders; 2015. p. 92.
[2] Dzaja E, Vasarhelyi EM, Lanting BA, et al. Knee manipulation under anaesthetic following total knee arthroplasty: a matched cohort design. J Bone Joint Surg Br 2015;97:1640.
[3] Esler CN, Lock K, Harper WM, Gregg PJ. Manipulation of total knee replacements. Is the flexion gained retained? J Bone Joint Surg Br 1999;81(1):27.
[4] Keating E, Ritter MA, Harty LD, et al. Manipulation after total knee arthroplasty. J Bone Joint Surg 2007;89(2):282.
[5] Issa K, Kapadia BH, Kester M, et al. Clinical, objective and functional outcomes of manipulation under anesthesia to treat knee stiffness following total knee arthroplasty. J Arthroplasty 2014;29(3):548.
[6] Werner B, Carr JB, Wiggins JC, Gwathmey FW, Browne JA. Manipulation under anesthesia after total knee arthroplasty is associated with an increased incidence of subsequent revision surgery. J Arthroplasty 2015;30(9 Suppl):72.
[7] Smith E, Banerjee S, Bono S. Supracondylar femur fracture after knee manipulation: a report of 3 cases. Orthopedics 2009;32(1):8.
[8] Namba R, Inacia M. Early and late manipulation improve flexion after total knee arthroplasty. J Arthroplasty 2007;22(6):58.