

A vascular complication in computer navigated total knee arthroplasty

Sandesh Gulhane, Ian Holloway, Mathew Bartlett

ABSTRACT

The use of computer navigation has the potential to improve implant position in total knee arthroplasty (TKA), but pin fixation of reference arrays introduces an additional potential source of complications. We report a case of vascular injury related to the insertion of a femoral pin during navigated TKA.

Key words: Navigated knee arthroplasty, total knee arthroplasty, vascular complications

INTRODUCTION

omputer-assisted surgery has been popularized in orthopedic surgery in the last 10 years. Whilst a number of recent randomized control trials have shown some benefit in terms of implant position over conventional jig-based referencing,¹ improved survivorship has not yet been demonstrated.

Many navigation systems require the use of reference arrays, which are fixed to the tibia and femur with pins. Reported complications include pin breakage,² superficial wound infection,³⁻⁴ prolonged operation time,⁵⁻⁸ and prolonged tourniquet time.⁸

CASE REPORT

A 58-year-old man with a diagnosis of varus osteoarthritis (OA) of the right knee underwent navigated total knee arthroplasty (TKA) using standard technique.

Our current practice is to use computer navigation for all

Department of Orthopaedic Surgery, Northwick Park Hospital, Watford Road, Harrow, London, UK

Address for correspondence: Mr. Sandesh Gulhane, 22 Temple Gardens, Goldersgreen, London, NW11 0LL, UK. E-mail: sandesh.gulhane@gmail.com,

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primary TKA. We use a passive reflector-based system (Brainlab, Feldkirchen, Germany) with fixation of the femoral reference array using two 3-mm-diameter threaded pins. These are inserted anteriorly through stab incisions, with the knee in flexion, as proximally as the tourniquet will allow. Tibial pins are inserted in the mid diaphysis into the subcutaneous surface of the tibia [Figure 1]. All pins are bicortical in order to maintain secure fixation for the duration of surgery.

Computer registration is performed with digitalization of the hip and ankle centers and specific landmarks of the knee. A size 6 generation II cemented femoral implant and a size 6 generationII cemented tibial component were implanted with an 11-mm polyethylene insert. There was no obvious complication during surgery.

The patient had some pain and thigh swelling postoperatively, but this was considered to be in keeping with recent surgery. He was discharged on the third postoperative day, having satisfied physiotherapy and occupational therapy goals.

He reported 3 days later with increased right thigh pain, swelling, and a limited range of movement. He was given analgesia and placed onto a continuous passive motion machine. Deep vein thrombosis and fracture were excluded on ultrasound scan and plain radiographs. An ultrasound guided diagnosis of a quadriceps hematoma at the site of the femoral pins was made. This was confirmed by computerized topography (CT) with intravenous contrast [Figure 2], which showed a large quadriceps hematoma and active bleeding into the femoral canal from a branch of the superficial femoral artery as it entered linea aspera at the site of pin insertion.

On day 10, the hematoma was evacuated and two 14-mm



Figure 1: Peroperative photographs (a) Insertion of tibial and femoral reference arrays (b) The styloid used to map out the tibia and femur



Figure 2: Two CT scan images showing active bleeding into the femoral canal

unicortical screws were inserted into the femur at the site of the bleed to tamponade the bleed. Unicortical screws were used to reduce the risk of further arterial injury with bicortical screws and the CT scan also showed unicortical injury.

At 2 weeks post presentation, he underwent a manipulation under anesthesia for ongoing stiffness. He then had a flexion of $0^{\circ}-90^{\circ}$, but also had some persistent swelling and was prescribed a short course of diazepam. He showed continued improvement since the second operation and had no further complications at the final followup 6 months later [Figure 3].

DISCUSSION

Computer navigated TKA has the potential advantage of improved implant position, which is known to reduce the rate of aseptic loosening. There have been a number of studies reporting complications of computer navigated TKA among these. Böhling *et al.*,⁹ Chin *et al.*,¹⁰ and Bäthis *et al.*¹¹ demonstrated longer tourniquet time with computer navigation.



Figure 3: Final followup X-ray showing insertion of two unicortical screws

Kalairajah *et al.*¹² reported a longer tourniquet time as well as a statistically significant decrease in blood drainage. Chauhan *et al.*¹³ and Jenny *et al.*⁴ found that computerized navigation was associated with a longer operating time.

Stöckl *et al.*¹⁴ reported one case of poor tibial tracker stability, related to osteoporotic bone, resulting in abandonment of computer navigation, from 64 patients. Victor *et al.*² found pin breakage in 3 patients from a population of 100. Hernańdez-Vaquero¹⁵ reported four cases of failed pin fixation (three iliac crest and one femur) requiring abandonment of computer navigation from a total of 112 patients.

Our report is the only case of arterial injury in the literature related to navigation pin usage. It highlights an important complication of computer navigated TKA. If the patient develops an unexpected postoperative swelling with increasing pain this diagnosis needs to be taken into consideration.

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