S.B. Tibrewal

The pneumatic tourniquet in arthroscopic surgery of the knee

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Abstract In a randomized study 56 patients undergoing arthroscopic surgery of the knee were randomly allocated to one of 2 groups: surgery with a tourniquet and surgery without a tourniquet. No significant difference was found between the 2 groups with regard to operating times, technical intraoperative difficulties, identification of intraarticular structures, postoperative pain or postoperative complications. In neither group was the procedure abandoned due to technical difficulties. The pain scores in the non-tourniquet group were lower than those in the group of patients operated on with the use of a pneumatic tourniquet. The study suggests that the use of a tourniquet in arthroscopic surgery of the knee is unnecessary.

Résumé Dans une étude randomisée, 56 malades qui ont eut une chirurgie arthroscopique du genou ont été séparés aléatoirement en deux groupes: chirurgie avec ou sans garrot. Aucune différence notable n'a été trouvée entre les deux groupes dans les durées d'opération, les difficultés techniques, l'identification des structures intra-articulaires, les douleurs ou les complications post-opératoires. Le score de la douleur dans le groupe sans garrot était inférieur à celui noté dans l'autre groupe. Pendant les six semaines suivant l'opération, il n'y avait pas de différence dans la récupération de la force musculaire ou de la flexion du genou.

Introduction

A pneumatic tourniquet has traditionally been used for arthroscopic surgery of the knee to provide a bloodless field and to facilitate the operative procedure. However, complications from the use of a pneumatic tourniquet

have been recorded. These include nerve paralysis [7, 9], vascular injury [2, 5], postoperative swelling and stiffness, delay in the recovery of muscle power, hyperemia on the release of the tourniquet and potential cardiac or respiratory complications [12]. Alterations in acid base balance [6], acute pulmonary edema and cardiac arrest immediately following release of tourniquet have also been reported [4, 8]. Tourniquet-induced rhabdomyolysis [11] and EMG changes in quadriceps mechanism have been recorded [10] and these may take months to recover. Simultaneous release of both tourniquets may be associated with increased morbidity and mortality [14]. A literature search including Medline failed to reveal a prospective randomized trial of the use of tourniquet in arthroscopic surgery.

In this study we assessed the effect of a pneumatic tourniquet in patients undergoing arthroscopic surgery, with particular reference to any intraoperative technical difficulties, postoperative pain, muscle function and any complications in both groups of patients.

Patients and methods

Fifty-six patients admitted for arthroscopic surgery of the knee as day-care patients were randomly allocated to 1 of the 2 groups by using a Kardex system. Patients in group A underwent arthroscopic surgery with the use of a pneumatic tourniquet and those in group B without. Patients with a previous history of thromboembolism were excluded from the study and we did not perform any bilateral procedures during the period of this study. All operations were performed by the author, with the patient under general anesthesia. All patients received intraarticular 0.5% Marcain (10 ml) as postoperative analgesia. No preoperative infiltration of adrenaline was used in this study. Postoperative pain was controlled with oral analgesia in all the patients.

All the patients were assessed pre- and postoperatively by using an assessment chart. Preoperative measurement included thigh and calf girth. We recorded intraoperative technical difficulties, particularly bleeding obscuring anatomical structures, and whether the procedure was more difficult without the use of a tourniquet. The postoperative assessment included recording the pain score by using a visual analogue chart and the dose of postoperative analgesia given was recorded. The thigh and calf circumferences were re-measured 5 and 12 days postoperatively. The times taken to

S.B. Tibrewal (✉)
Department of Orthopaedic Surgery, Greenwich District Hospital,
Vanbrugh Hill, Greenwich, London SE10 9HE, UK
e-mail: sb.tibrewal@virgin.net
Tel.: +44-20-82955795, Fax: +44-20-82955795

Table 1 Diagnoses in the two groups of patients

	Group A (n=26) With tourniquet	Group B (n=30) Without tourniquet
Medial meniscal tear, with or without other associated lesions	7	9
Lateral meniscal tear	4	4
Debridement of chondral flap tears and severe osteoarthritis, including synovectomy	11	12
Torn anterior cruciate ligament (isolated)	1	1
Loose bodies	0	1
Patello-femoral pathology, e.g. osteoarthritis, chondromalacia	2	2
No significant pathology	1	1

achieve straight leg raise and full knee flexion were noted and the power of quadriceps and hamstring muscles were assessed clinically. The occurrence or absence of deep venous thrombosis, haemarthrosis or effusion within the knee joint, and superficial or deep infection of the wounds, were also recorded. The pre- and postoperative measurements were made by the senior house officers who were unaware of whether a tourniquet had been used. The Student's *t*-test was used to analyze the data.

Results

There were 26 patients in group A and 30 in group B. The average age of the patients in group A was 47.7 years and in group B 44.3 years (range for all patients: 18–68). The intraoperative diagnoses are given in Table 1.

There was no significant difference between the two groups in operating time (average 35 min; range: 20 min to 60 min) and no difficulty was experienced in identification of the intraarticular structures. In neither group was a procedure abandoned due to technical difficulties. All patients were discharged home on the day of the surgery and none required hospital stay.

No patients required intramuscular injections for pain relief. The average postoperative pain score in group A was 4.5 and in group B was 3.58. The use of oral analgesia was rare in both groups. All but 2 patients in each group had recovered at least 90° of flexion and all could straight leg raise at the first follow-up examination (5 days). All patients regained their knee movements within 2 weeks of surgery except 1 patient in group A. The pre- and postoperative measurements of the thigh and calf circumferences at fixed points did not show a statistically significant difference between the 2 groups. Muscle power in both groups was grade 4/5° at their first visit without significant difference between the 2 groups and grade 5 in both groups 2 weeks postoperatively.

None of the patients developed postoperative haemarthrosis or significant effusion. No evidence of infection or deep venous thrombosis was encountered in either group. In group A, difficulty was experienced on one occasion in a very obese patient due to malfunction of the tourniquet. In this patient excessive bleeding was experienced and the tourniquet had to be removed to complete

the surgical procedure. In group B, two cases of intraoperative bleeding from the portal holes were encountered but did not affect the surgical procedures.

Discussion

Despite some reports [1, 3, 13] the conventional practice of using a tourniquet in arthroscopic knee surgery continues. One reason for this may be a lack of randomized studies. This prospective randomized study shows that arthroscopic surgery of the knee can be safely performed without the use of a pneumatic tourniquet; thus, avoiding the possible potential complications and morbidity associated with its use.

We did not encounter any intraoperative technical difficulty or difficulty in identification of intraarticular structures when the tourniquet was not used. Although no preoperative infiltration with adrenaline was used in this study, this may further help minimize bleeding from the portal wounds. A good irrigation flow and power suction system is helpful in operating when the tourniquet is not used.

The postoperative pain in the group without the tourniquet was slightly less when compared to the other group and there were no undue complications in either group of patients. The recovery of knee function in the early postoperative period was slightly better in patients in whom the tourniquet was not used but there was no significant statistical difference between the two groups.

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