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The Impact of Tourniquet use in Total Knee Arthroplasty

AKADEMISK AVHANDLING
som för avläggande av medicine doktorsexamen vid Karolinska
Institutet offentligen försvaras i Aulan, Södersjukhuset, Stockholm

Fredagen den 19 april 2013, kl 09:00

av

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Stockholm 2013

ABSTRACT

Use of the tourniquet in extremity surgery is considered to be an important tool because it prevents intraoperative bleeding and thereby improves visualization of the surgical field. However, its use is not without risks, and complications may occur. The overall aim of this thesis was to increase our knowledge of tourniquet use in order to improve patient safety during knee arthroplasty surgery.

In **Study I**, a Randomized Controlled Trial (RCT) including 94 patients undergoing Total Knee Arthroplasty (TKA) surgery, the aim was to determine whether there were any differences between different protecting materials and no protective material regarding skin injuries after TKA surgery with tourniquet use. The elastic stockinette was significantly better than having no protective material and there was a trend towards better results in the elastic stockinette group compared to the cast padding group.

In **Study II**, a RCT in 164 patients undergoing TKA surgery, the aim was to investigate whether the limb occlusion pressure (LOP) method reduces the cuff pressure used during surgery and if this would affect postoperative pain, knee range of motion (ROM) and wound complications. Patients in the LOP group had a tourniquet cuff pressure of ≤ 225 mm Hg more often than those in the control group. The mean tourniquet cuff pressure was also generally lower in patients in the LOP group, but this difference was not significant. Ratings of postoperative pain on the WOMAC questionnaire did not differ between the randomization groups. An important secondary finding was that patients with a cuff pressure of ≤ 225 mm Hg had no postoperative infections and a lower rate of wound complications.

In **Study III**, a part of Study II with 20 consecutively enrolled patients, the aim was to determine the incidence of nerve injuries related to the use of a tourniquet after TKA surgery and to analyze the results of neurophysiological examinations in this patient group. Electromyographic signs of denervation were found in one patient who also had the highest cuff pressure in the study population (294 mm Hg). The sensory nerve response amplitudes were lower in the operated leg on day 3 and at two months. Otherwise, the neurophysiological examinations showed no differences between the legs.

In **Study IV**, a prospective register study of 641 patients undergoing knee arthroplasty surgery, the aim was to investigate whether tourniquet time influenced the risk of postoperative complications after a knee arthroplasty and whether factors such as age, sex, the American Society of Anesthesiologists (ASA) classification, diabetes, smoking, or tourniquet cuff pressure affected the risk of postoperative complications. Tourniquet time > 100 min was associated with a significantly increased risk of complications after knee arthroplasty surgery. When tourniquet time was analyzed as a continuous variable the odds for having a complication increased by 20% for every 10 min of longer tourniquet time.

Conclusions Tourniquet use can be a safe and reliable tool. Key factors to avoid postoperative complications after tourniquet use are, according to this thesis, use of an elastic stockinette underneath the tourniquet cuff, a cuff pressure of 225 mm Hg or lower, and an as short as possible tourniquet time, preferably 100 min or less.