Does external leg rotation facilitate femoral venipuncture?

Editor—Although the femoral vein (FV) is often used for central venous access, it carries a potential risk of femoral artery (FA) puncture. This complication is usually benign, but massive retroperitoneal haemorrhage,\(^1\) femoral nerve palsy\(^2\) and arterio-venous fistula\(^3\) have been reported. To avoid this complication, patient position is extremely important but the advantages of external leg rotation have not been reported. We have measured the anatomical relationships of FA and FV with the leg in external rotation or extension.

After ethical committee approval and written informed consent, 19 healthy male volunteers (mean age, height and weight 35.4 yr, 172.3 cm and 68.5 kg, respectively) were placed supine in a Fowler position with about 15° elevation, allowing dilatation of the FV.\(^4\) The positions are shown in Figure 1A and B. Right femoral vessels were examined using an SSA-260A ultrasonograph (Toshiba, Tokyo, Japan) and a PLF-703NT 7.5-MHz linear probe (Toshiba, Tokyo, Japan) at 3 sites: at 0, 2 and 4 cm below the inguinal ligament (IL). Ultrasonographic images of the cross-sections of femoral vessels were obtained under minimum pressure between the probe and skin. FA–FV overlap, depth of FV from the surface, and FV transverse and antero-posterior diameters were determined and compared. Wilcoxon single-rank testing was used for statistical analysis, with \(P<0.05\) considered statistically significant.

External rotation significantly decreased FA–FV overlap and FV depth at all levels and the transverse diameter of FV was significantly decreased at 0 and 2 cm below, but not at 4 cm below the IL compared with extension. With external rotation, the antero-posterior diameter of the FV was significantly decreased only at the level of the IL.

Our study demonstrates the anatomy of the femoral vessels of the right groin to 4 cm below the IL. In both positions, FA–FV overlap and FV depth were minimal up to 2 cm below the IL. Below that, the FV runs more laterally and deeper, overlapping with the FA, and at 4 cm the FV lies just posterior to the FA and is completely hidden by the FA on anterior-view ultrasonography. The distal part of the FV runs laterally to the FA. This anatomy, with the FV crossing below the IL, is well described. Hughes performed in vivo ultrasonography in humans and described similar results to ours.\(^5\) Thus, our results appear to confirm that the optimal needle insertion site for safe femoral venipuncture is up to 2 cm below the IL.\(^5\) Our results also demonstrated that FA–FV overlap is decreased in external rotation, which also has the effects of decreasing FV depth and increasing transverse and antero-posterior FV diameters; not only facilitating cannulation of FV, but also decreasing the risk of accidental FA puncture. External rotation of the thigh decreases lateral pressure against the femoral vessels by lateral shift of the ilio-lumbar and quadriceps muscles, and decreases muscle tension in these muscles.

Since Duffy introduced femoral vein catheterization,\(^5\) clinicians recommended external rotation for safe and reliable femoral venipuncture, presumably based on clinical experience. Our ultrasonographic study, in a small way, appears to support this view.

N. Kitagawa*  
M. Oda  
T. Totoki  
M. Morimoto  
Saga, Japan  
*E-mail: kitagawa@mail.anes.saga-med.ac.jp

Fig 1  (A) Leg extension (EX) represents the posture maintaining functional leg position. (B) External leg rotation (ER) represents the posture with external rotation of the coxofemoral joint while keeping the coxofemoral and femorotibial joints slightly flexed.
Minimum effective local anaesthetic dose for spinal anaesthesia

Editor—As a comparison of the dose of local anaesthetic required for spinal anaesthesia with either levobupivacaine or ropivacaine, the study by Sell and colleagues is both interesting and informative. However, I have a number of concerns about the paper that has been based on that study.

In the title, and subsequently, the authors describe plain solutions of both drugs as being ‘isobaric’ yet the density figures they quote in the paper are well below the normal range for CSF. These solutions are not isobaric with cerebral spinal fluid and they spread in a manner that is different from those that are truly isobaric, the primary difference being much wider variability in the total spread produced.

In the introduction, the authors state that the minimum local anaesthetic concentration (MLAC) concept has been established for spinal and epidural anaesthesia, but I know of no work validating this methodology for spinal anaesthesia. All the published papers relate to epidural injection and the validity of the approach in that block is somewhat controversial. It is claimed that the MLAC concept is equivalent to that of MAC for general anaesthetics, but even the validity of that concept has been seriously questioned. Furthermore, one of the references used in support of a statement that the methodology provides ‘reliable estimates of MLAD using the up-and-down method’ is by authors who have concerns that the method is not reliable.

Sensory and motor block were assessed at 20 min only, but it is well recognized that it may take 30 min or longer for the effect of an intrathecal injection to become maximum.

In regard to the controversy over using MLAC figures to make potency comparisons between local anaesthetic drugs, I think that the results of this study are quite interesting. The difference in MLAD (ED50) was small and non-significant, although ropivacaine is commonly thought of as less potent than the other long-acting local anaesthetic drugs, and the total dose ED100 of both drugs required to complete surgery was close to 15 mg, the dose that most practitioners would consider appropriate for a spinal anaesthetic. In spite of this, the authors claim that their study did not allow them to evaluate the top end of the dose–response curve. In addition, in order to be able to execute this study in a busy unit, we had certain time frames to meet—again a fact that is clearly stated in the report. However, we feel that few anaesthetists would wait for more than 20 min before administering a top-up dose via a spinal catheter, should that be required.

The protocol did not dictate how the study drugs were to be administered after the initial dose and the first 20 min had passed. The supplemental doses were administered based on the clinical assessment by the attending anaesthetist. Thus, we feel that the supplemental doses were given in too random a situation to be used in the assessment of the dose–response curve. In addition, we wanted to particularly assess the MLAD region, as that dose can guide us initially in using as small doses as possible to patients susceptible to such adverse effects as hypotension and in whom supplemental doses can easily be given utilizing the spinal catheter.

In contrast to Wildsmith, we feel that determining the ED100 would not be very interesting. We assume that the local anaesthetic dose requirements more or less follow a normal distribution. Thus, determining ED100 and letting that guide us in administering local anaesthetics to patients, in whom adverse effects are to be avoided, could lead to over-shooting in dosing. This can easily be demonstrated if normal distribution and a dose–response curve are drawn on a single figure.

Baricity is a major determinant of intraspinal local anaesthetic spread. We should probably have stated this to provide a more comprehensive list of all factors affecting local anesthetic spread, although our study deals with essentially isobaric solutions. The fact that the catheter itself, particularly its tip position, may affect local anaesthetic distribution is stated in the paper.

We did not study ‘patient comfort’ as correctly pointed out by Wildsmith. Thus our conclusion is based only on the subjective

The final conclusion of the paper is irrelevant because ‘patient comfort’ was not studied. I am sorry to write in such a critical fashion about an interesting study.

J. A. W. Wildsmith
Dundee, UK
E-mail: j.a.w.wildsmith@dundee.ac.uk

Editor—Thank you for giving us the opportunity to respond to Wildsmith’s criticisms of our paper. We were unfortunately not able to measure the individual CSF densities, and thus we had to rely on previous documentation, such as Lui and colleagues and Hocking and Wildsmith. The latter review states that ‘...given the normal variation [of CSF], it is necessary that solutions that are to be predictably hypobaric or hyperbaric in all patients have baricities below 0.9990 or above 1.0010, respectively’. The reported densities of the local anaesthetics used by us lie within these limits and thus, we argue that the solutions used by us are essentially isobaric.

We present MLAC as a previously reported example of a similar approach to assess the effects of local anaesthetics in a set-up similar to that we used in our study (i.e. the up–down sequence). We do not argue that the MLAC concept would be equivalent to the MAC concept, which it certainly is not in our opinion. To those readers who want to critically review our methodology we have provided references for the up–down sequence, both the original Dixon paper as well as a recent report using more complex mathematical approaches in assessing the reliability of the method.

It is true that our study period probably did not allow enough time for the maximal effect of the initial dose to be achieved. However, we feel that readers will understand from our statement in the paper that we only looked at the first 20 min after drug administration and that this is a limitation. In addition, in order to be able to execute this study in a busy unit, we had certain time frames to meet—again a fact that is clearly stated in the report. However, we feel that few anaesthetists would wait for more than 20 min before administering a top-up dose via a spinal catheter, should that be required.

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Correspondence