The Nasion Should Be Considered As The Best External Landmark For External Ventricular Drain Placement.

Sophie Schuind MD; Sarah Lonneville; Julien Spitaels MD; Olivier Jean De Witte MD, PhD; Michael Bruneau MD, PhD

ULB Erasme Hospital, Brussels, Belgium

Introduction

Despite external ventricular drain (EVD) placement is known to be inaccurate, a few studies suggest that the conventional technique should be modified. Our goal was to assess if the ipsilateral medial canthus (IMC) should still be considered as the best external landmark or if other ones should be preferred.

Methods

The preoperative 3D-CT scan of 45 consecutive patients requiring EVD placement were selected if no medial shift was present and served to reconstruct virtual trajectories on a radiological workstation. All trajectories were drawn to pass through the Kocher's point, considered as entry point and were all directed to the tragus in the coronal plane. They were then all directed variably in the sagital plane, respectively to the IMC, the nasion and the contralateral medial canthus (CMC) with the goal to determine their relationship with the frontal horn of the lateral ventricle (Figure 1).

Figure 1: Reconstruction of the virtual trajectories
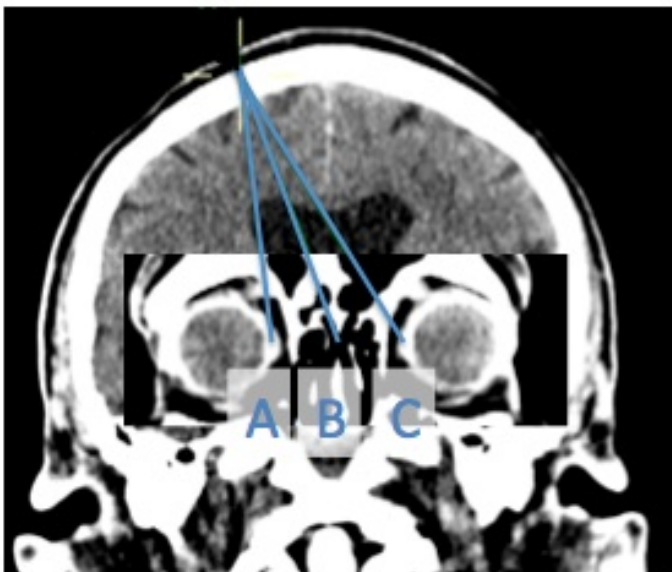
On 3D-CT scan, reconstruction of the lines, on the plane of the tragus, passing through the Kocher's point and directed to the IMC (A), the nasion (B) and the CMC (C)


The ideal trajectory was subsequently defined as targeting the middle of the foramen of Monro and projected on the skin in the sagital plane (Figure 2).

Figure 2: Ideal trajectory
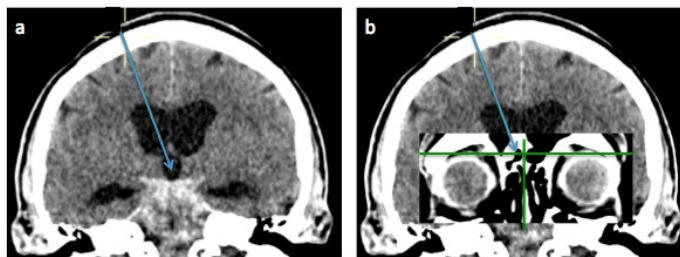
The ideal trajectory targetting the foramen of Monro is projected anteriorly (a). The distance from this projection and the nasion is measured (b).

### Figure 3: Trajectories reaching the frontal horn of the lateral ventricle
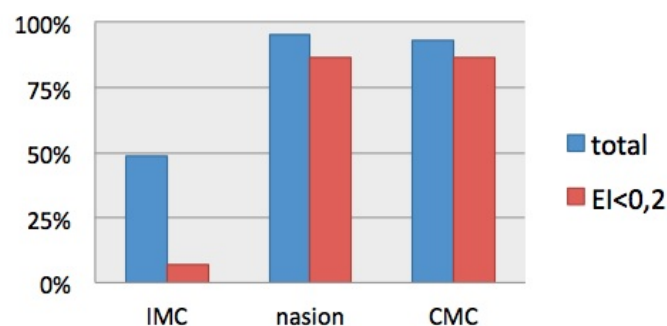
Percentages of cases in which the ipsilateral frontal horn is reached when the different landmarks are used and according to the Evans index (when considering all cases (n=45) in blue and cases with Evans index lower than 0.2 (n=15) in red).

Results

Trajectories directed to IMC, the nasion, and the CMC reached the frontal horn of the lateral ventricle respectively in 49%, 95%, and 93% of cases (p<0,001) (Figure 3). These rates decreased respectively to 7%, 87%, and 87% when the Evans Index was lower than 0.2 (p<0,001).

The projection on the skin of the 45 ideal trajectories was distributed along a gaussian curve centered 0.8mm away from the nasion on the ipsilateral side (Figure 4).

Figure 4: ideal landmark related to nasion
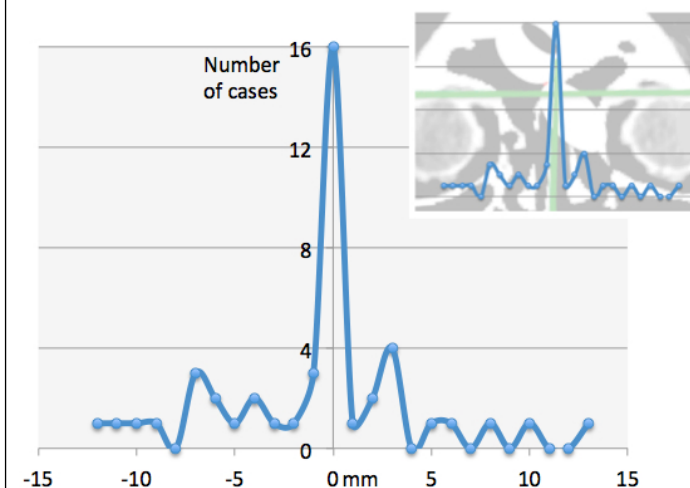
Distance from the nasion of the ideal trajectory, projected on the face, when passing by the Kocher's point and the middle of the foramen of Monro. The negative and positive values represent the ipsilateral and contralateral side respectively.

Conclusions

External landmarks should be adapted for every patient by reconstructing preoperatively the ideal trajectory on 3D-CT scan to maximize the accuracy of EVD placement. Otherwise, the nasion should be preferred to the IMC, giving the highest probability to target the frontal horn of the ventricle.

Learning Objectives

By the end of this session, participants should be able to:
1) place EVD more accurately,
2) know the importance of reconstructing virtual trajectories before surgery in each case.

References

1. Muirhead et al, Br J Neurosurg, 2012 Oct
2. Toma et al, Neurosurgery, 2009