Originals

Fossa Posterior Measurements

Significance of Sella to Floor of 4th Ventricle Measurements (Normal Position of Floor of 4th Ventricle)

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Abstract. Two proportional methods are introduced to determine the normal position of the floor of the 4th ventricle expressed by two preventricular ratios: \( \frac{ds - T_4}{Tw} \) and \( \frac{Ts - T_4}{Tw} \), where \( ds = \) dorsum sellae, \( Ts = \) tuberculum sellae and \( Tw = \) Twining's line. \( T_4 \) is the intersection between \( Tw \) and the floor of the 4th ventricle. The methods give information of the position of the 4th ventricle, the diameter of pons and the a-p diameter of the pituitary fossa.

Key words: Fossa posterior measurements – 4th ventricle – Pneumoencephalography – Pituitary fossa – Pons

In 1939 Twining [4] introduced his classic line and landmark to pick up the fourth cerebral ventricle in the lateral view of the pneumoencephalogram. During these past 35 years his method has been one of the most reliable ones in neuroradiological diagnostics. To cite Twining: "The landmarks I use are tuberculum sellae and the internal occipital protuberance. – A point bisecting this line gives with very fair accuracy the position of the center of the fourth ventricle; sometimes it corresponds with its floor, but sometimes with its middle".

In pneumoencephalograms (PEG) often the fastigial part of the fourth ventricle is not outlined while the floor is visible. In such cases the ventral wall alone is the reference point of identification. The purpose of the present investigation is, therefore, to show that the situation of the floor of the fourth ventricle most possibly indicates more accurately the normal position of the fourth ventricle in the lateral view of the PEG.

Material and Method

Two materials were investigated: 1. Forty normal PEG in the age group seven to 57 years were studied in the lateral view together with 2. an infancy – children material of 15 normal PEG in the age group 1 month to 5\( \frac{1}{12} \) years (Fig. 1). The last mentioned group was tested against the "adult" the one being plotted as marks x and both are detailed in the same diagram. PEG showing oblique projections were discarded. The film-focus distance was about 75 cm. Using a ruler the measurements were made on composite tracings from individual PEG and given in whole mm only. The line of Twining (Tw) was drawn between its landmarks tuberculum sellae (Ts) and the internal occipital protuberance (IOP). Along this line lodged in the midsagittal plane the follow-

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Fig. 1. Age distribution of 15 normal infants and children (x) and 40 normal subjects in the age group 7 to 57 years whose PEG were investigated
ing distances were measured in the “adult” group: Ts to the floor of the fourth ventricle (T4) and dorsum sellae (ds) to T4 (Fig. 2). Absolute measurements were not performed in the infancy-children material because of the greater dispersal. The distances ds - T4 and Ts - T4 express the situation of the floor of the fourth ventricle. The first one in addition includes the diameter of the pons and the pontine cistern if measurement is in the midsagittal plane.

When expressing the distances proportional to the length of Tw in each individual PEG two fourth-ventricle-ratios could be introduced, viz: \( \frac{ds - T4}{Tw} \) and \( \frac{Ts - T4}{Tw} \). Their values were calculated as well as individual sketches for each method used (Fig. 3 and Fig. 4). By prolonging the quotient lines to the left in each of the sketches, the infancy and children material could be plotted into the original diagrams as marks x thereby disclosing the validity of the methods described in terms of proportion - valid for all skull dimensions investigated.

**Results**

The absolute measurements in the “adult” material 1 showed ds - T4 in mean to be 38.3 mm \( \pm \) 3.5, and in range 31 to 46 mm. Davidoff and Dyke [1] found a fairly constant length of 33 to 40 mm and Sutton [3] indicated a range between 31 to 44 mm showing a good accordance between these and the present investigation. The value of the ratio \( \frac{Ts - T4}{Tw} \) was 0.46 \( \pm \) 0.02 and of \( \frac{ds - T4}{Tw} \) was 0.33 \( \pm \) 0.03.

**Discussion**

All measurements were made in the midsagittal plane and along Twining’s line which lies in the same plane. The profiles of the bony landmarks were distinct in every PEG investigated. The posterior surface of the dorsum sellae corresponds practically to the bony surface because the dura lining this upper part of clivus is tightly adherent [2]. Thus, no major errors had to be considered. As correct projections of the X-ray is important when evaluating absolute distances this is not so if proportional measurements are used. The distances measured are incident on the same line (Tw) and any change of position will retain the

[Fig. 2. Sketch showing contour of Tuberculum sellae (Ts), dorsum sellae (ds) and internal occipital protuberance (IOP). Twining’s line between Ts and IOP intersects the ventral wall of the 4th ventricle at T4. All distances were measured along Twining’s line in the mid-sagittal plane.

[Fig. 3. The preventricular distance ds - T4 plotted proportional to the length of Twining’s line. All of the 4th ventricle ratio \( \frac{ds - T4}{Tw} \) calculations fell between quotient lines 0.40 and 0.28, in mean 0.33 \( \pm \) 0.03. Marks x indicate infants and children only. Arrows mark the bounds of the 7 to 57 years group of plottings.

[Fig. 4. The preventricular distance Ts - T4 plotted proportional to the length of Tw. All calculations of the ratio \( \frac{Ts - T4}{Tw} \) fell between the quotient lines 0.50 and 0.41, in mean 0.46 \( \pm \) 0.02. Marks x indicate infants and children only. Arrows as in Figure 3.]