Surface Projection of Internal Acoustic Meatus

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Abstract

Introduction: The cerebellopontine angle tumours account for 8% of all intracranial tumours in infants. Today, the availability of non-invasive imaging procedure such as CT scan and MRI, make it easy to diagnose them and some successful operations have been done by enlarged middle cranial fossa approach (Haider, 1992). When translabyrinthine and middle cranial fossa approaches are contraindicated, the posterior cranial fossa approach could be tried for cerebellopontine angle tumours.

Aim: This study aims to collect adequate gross information which may be of help in various surgical interventions of the facial nerve; for example cerebellopontine angle tumours.

Materials & Methods: 39 fetal craniums were used for measurements to locate the internal acoustic meatus from surface. Two intact fetal heads were used to confirm this method of reaching the Internal Acoustic meatus (IAM) from the entry point.

Cranial index was calculated for all the skulls: For surgical procedures to reach the IAM from surface and for biopsy with a needle, the following measurements were made.

1. Distance between the entry point and surface point.
2. The angle between the entry point, internal acoustic meatus, and the surface point.
3. Depth of IAM from EP.

Observation: Percentage ratio of the entry point to cranial index, IAM to cranial index & depth of IAM to cranial index respectively, the mean value were found to be 3.11, 45.3 & 4.13 respectively. The constants derived were utilized to locate the entry point of the needle, angle of passage and the depth to which it should be passed. The validity of this method was verified in the 39 exposed craniums. Two intact fetal heads were used to confirm this method of reaching the IAM from the entry point.

Keywords: Cerebellopontine angle tumours, Facial nerve, Internal acoustic meatus (IAM)

Introduction

The IAM is a short bony canal that lies between the posterior surface of the petrous pyramid and bony labyrinth within the dense petrous bone (standring 2005). Many investigators have studied the IAM on radiographs, on casts, in dissected temporal bones, and in histological sections (Lescanne et al., 2002). Moeller (2000) in his book "Normal findings in radiology" reckoned the width and length of IAM 5mm (2-12mm) and 8mm (4-25mm), respectively.

Bilateral acoustic neuromas were first described in 1882 by Wishart and in 1843 by Knoblauc. In 1882 Fredrick Von Recklinghausen described five patients with multiple peripheral neurofibromas, a condition which later came to be known as Von Recklinghausen's (VRD). Revilla (1948) reported the following distribution of the tumours found in the cerebellopon-tine angle in a series of 205 cases; 78% neurinomas; 6% meningiomas; 6% epidermal cysts and congenital Cholesteatoma; 6% glomus tumour (paragangliomas) and 4% miscellaneous tumours of unspecified type.

Hearing preservation in patients with bilateral tumours was first described by Hitselberger and Hughes (1968). The ability to preserve hearing increases the therapeutic dilemma in the management of these hard to treat cases. Smith et al., (1981), Glasscock et al., (1985) and Hughes (1982), found that hearing preservation is more difficult in patients with bilateral tumours than with unilateral tumours.

Neonatal brain tumours are rare, but it is so important a disease when considering the pathogenesis of brain tumour. The availability of the non-invasive procedures such as CT scan and MRI made it easy to diagnose (Inoue et al., 1994). Enlarged middle cranial fossa approach has been

tried for cerebellopontine angle tumours (Haid et al., 1992)

Aim

This study aims to collect adequate gross information which may be of help in various surgical measures of the facial nerve; for example cerebellopontine angle tumours. When facilities are not available, the posterior cranial fossa approach could be tried for cerebellopontine angle tumours. Such information on South Indian subjects are not available and hence the importance of this study.

Materials & Methods

Forty one full term dead born foetuses (Table I) from obstetrics & gynaecology departments of Government R.S.R.M. hospital, Madras and Chengalpattu Medical College Hospital were utilized for present study.

Necessary permission had been obtained from the Deans of the concerned institutions for collecting the dead born foetuses for this purpose. The consent of the mothers of the foetuses was also obtained to utilize the material for research purpose.

39 fetal craniums were used for measurements to locate the internal acoustic meatus from surface. Two intact fetal heads were used to confirm this method of reaching the IAM from the entry point.

The maximum length anteroposteriorly in the outline was measured and it forms the maximum cranial length. The maximum breadth in the transverse plane was measured and it forms the maximum cranial breadth. These measurements were counter checked by measuring the fetal head using pelvimeter (Fig. 1&2).

From these measurements the cranial index was calculated (Table II) for all the skulls by using the following formula:

$$\frac{\text{Maximum Cranial Breadth}}{\text{Maximum Cranial Length}} \times 100$$

Cranial cavity was exposed (Fig. 6) and the brain was removed. After exposing the cranial cavity the fetal head was fixed in a cubic craniophore (Fig. 3) the outline of the base of the skull was drawn (Fig. 7) the position of the porion which corresponds to highest point on the External acoustic meatus was marked. A line pp' connecting the porion was drawn. A line was connecting the two internal acoustic meatuses and this line was extended to the surface of the skull (sp sp'). This point is referred as the surface point. Two other oblique lines were drawn passing through the superior border of the petrous part of the temporal bone & IAM. These lines meet and intersect each other in the mid Sagittal plane. The place where this line reaches the circumference behind the surface point was taken as the entry point.

The distance of IAM from porion in sagittal plane, coronal plane and horizontal plane were measured using Martin's needles(Fig. 4) to locate the IAM in a three dimentional manner sagittal positioning, coronal positioning and horizontal positioning of the internal acoustic meatus of various foetuses were carried out(Table III,IV,V) using the following formulae:

$$\text{Ratio of sagittal positioning of IAM} = \frac{\text{Distance of IAM from S.P}}{\text{Cranial Index}} \times 100$$

$$\text{Ratio of Coronal positioning of IAM} = \frac{\text{Distance of IAM from Porion}}{\text{Cranial Index}} \times 100$$

$$\text{Ratio of horizontal positioning of IAM} = \frac{\text{Height of IAM from Porion}}{\text{Cranial Index}} \times 100$$

The ratios of the Sagittal, coronal, and horizontal positioning of IAM in 39 craniums were determined and the mean of these values were calculated. These mean values serve as the constants to derive at the measurements in a given skull in the following manner

$$\text{Sagittal positioning of IAM} = \frac{\text{Constant derived X Cranial Index}}{100}$$

$$\text{Coronal positioning of IAM} = \frac{\text{Constant derived X Cranial Index}}{100}$$

$$\text{Horizontal positioning of IAM} = \frac{\text{Constant derived X Cranial Index}}{100}$$

For surgical procedures to reach the IAM from surface and for biopsy with a needle, the following measurements were made.

1. Distance between the entry point and surface point.
2. The angle between the entry point, internal acoustic meatus, and the surface point.
3. Depth of IAM from EP.(Fig. 4)

The ratios of these values were calculated as follows:

$$\text{Ratio of entry point to cranial Index} = \frac{\text{Distance of entry point from surface point}}{\text{Cranial Index}} \times 100$$

$$\text{Ratio of IAM angle to cranial Index} = \frac{\text{Entry point angle}}{\text{Cranial Index}} \times 100$$

$$\text{Ratio of depth of IAM to cranial Index} = \frac{\text{Depth of IAM from entry point}}{\text{Cranial Index}} \times 100$$

These values derived from 39 fetuses were tabulated and their mean value was derived (Table VI, VII, VIII). These mean values derived from the constants which can be utilized to reach the internal acoustic meatus from the surface for any given fetal skull using the following formula.

$$\text{Distance of entry point from surface point} = \frac{\text{Constant derived} \times \text{Cranial Index}}{100}$$

$$\text{EP, IAM, SP angle (Angle of passage)} = \frac{\text{Constant derived} \times \text{Cranial Index}}{100}$$

$$\text{Depth of IAM from entry point} = \frac{\text{Constant derived} \times \text{Cranial Index}}{100}$$

The constants derived were utilised to locate the entry point of the needle, angle of passage and the depth to which it should be passed (Fig. 8). The validity of this method was verified in the 39 exposed craniums. Two intact fetal heads were used (Fig. 5) to confirm this method of reaching the IAM from the entry point.

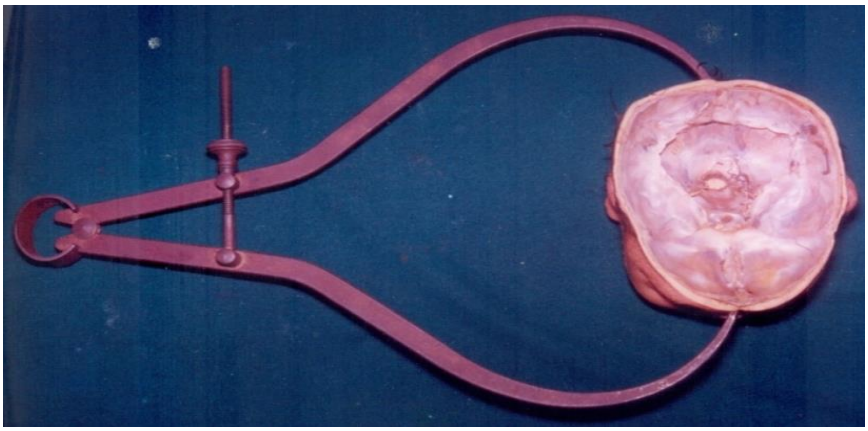

Fig. 1: Pelvimeter used to take the maximum cranial length. (The tip of the pelvimeter is kept at the Nasion and the external occipital protuberance)

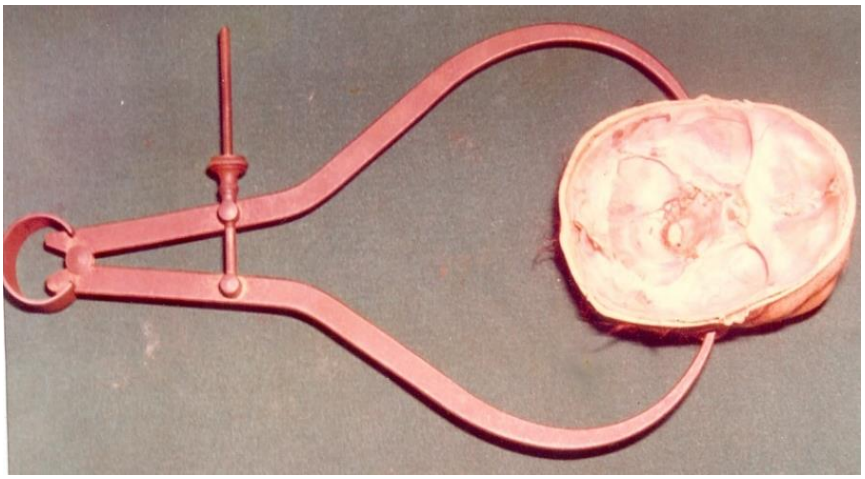

Fig. 2: Pelvimeter used to take the maximum cranial breadth. (The tip of the pelvimeter is kept at the porion on either side)

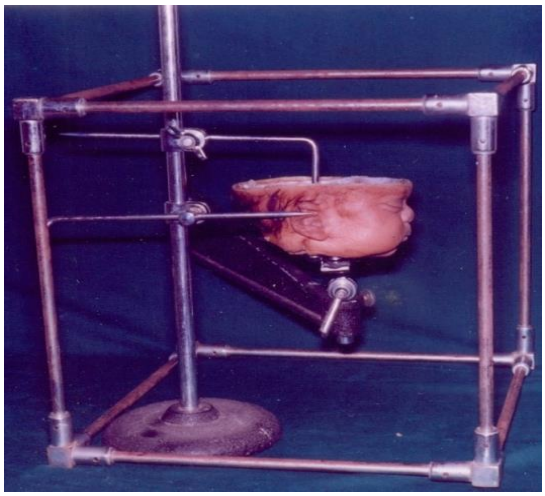

Fig. 3: Human fetal head fixed in cubic craniophore in Frankfurt's plane to take cranial measurements. (The Martins horizontal needle is pointing the porion and the curved needle is pointing the IAM)

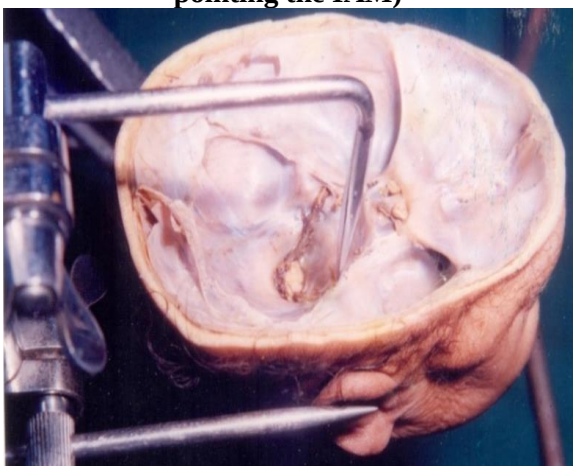

Fig. 4: Close view of human fetal head fixed in cubic craniophore in Frankfurt's plane to take cranial measurements. (The Martins horizontal needle is pointing the porion and the curved needle is pointing the IAM)

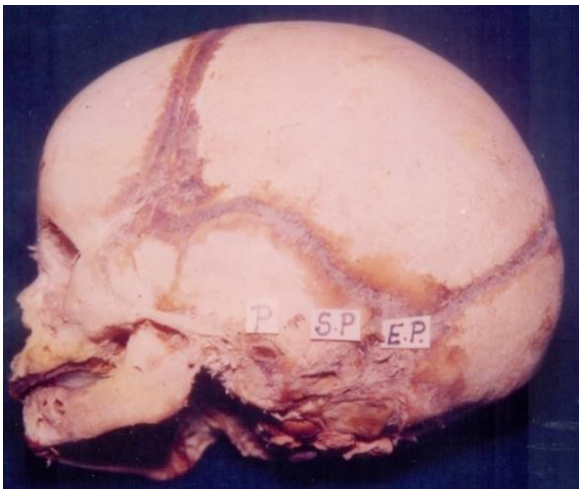

Fig. 5: Photograph of teh fetal skull showing the porion, surface point and entry point in the lateral view

P – Porion, SP – Surface Point, EP – Entry Point

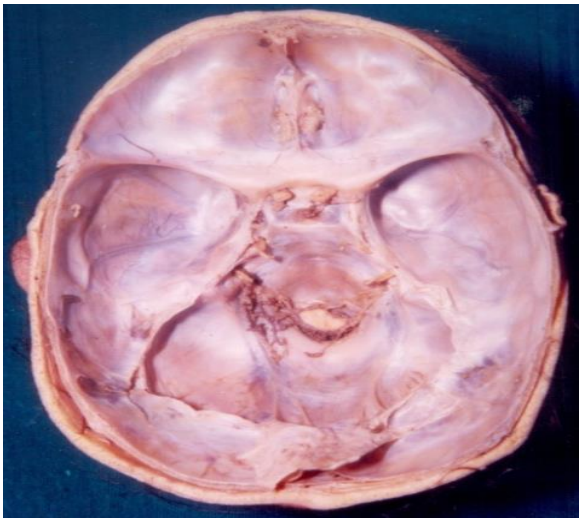

Fig. 6: Superior view of cranial Cavity of the human fetal head

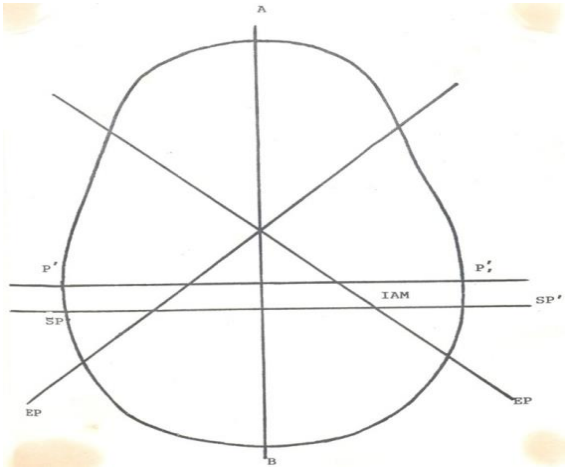

Fig. 7: Line diagram of the cranium showing the planes that are made use of in surface marking the IAM

IAM – Internal Acoustic Meatus, SP SP' – Line passing through IAM
AB – Sagittal Plane P P' – Line passing through porion
EP – Lies drawn through the IAM parallel to superior border of the petrous part of temporal bone intersecting each other in midsagittal plane

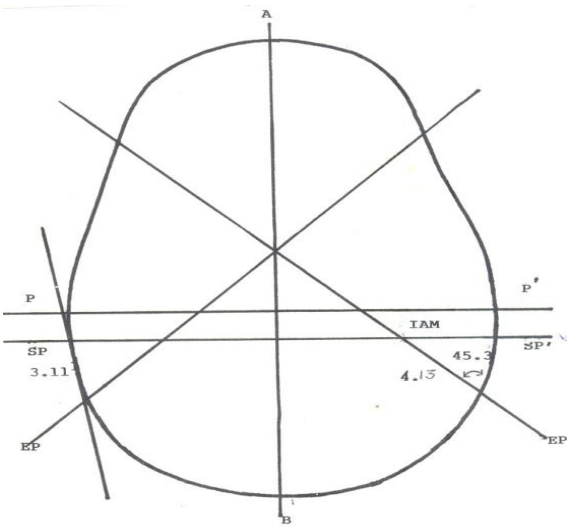

Fig. 8: Line diagram of the cranium showing the constants derived to reach the IAM with a needle from the Entry point
IAM – Interal acoustic meatus, P- Porion; SP – Surface Point

Table 1: various measurements of the human foetuses (HF) used for the study

Hf. No	Sex of the full term foetus	Weight in kg	Head circumference in cms	C.H length in cms
1	Male	3.75	36.5	50.2
2	Female	2.9	34.0	49.0
3	Female	2.7	33.5	48.6
4	Female	3.5	34.5	49
5	Male	2.8	34.5	49.6
6	Male	2.8	34.5	48.4
7	Male	2.7	33.5	50.0
8	Male	3.0	34.0	50.5
9	Female	2.9	33.5	49.2
10	Male	2.0	31.0	48.0
11	Female	3.2	34.5	50.2
12	Female	2.8	34.5	48.6
13	Female	2.8	33.5	48.0
14	Female	2.7	32.0	46.0
15	Female	3.8	34.5	50.6
16	Female	3.0	34.0	47.2
17	Female	2.7	33.0	47.0
18	Female	2.8	33.6	48.0
19	Female	4.2	36.5	50.8
20	Male	2.9	34.5	50.0
21	Male	3.5	33.5	50.2
22	Female	3.0	33.0	48.4
23	Male	2.2	33.5	48.0
24	Male	3.0	35.0	48.8
25	Male	2.8	34.0	48.0
26	Male	2.8	35.5	50.0
27	Male	3.0	33.5	48.0
28	Female	2.7	34.0	48.2
29	Male	3.0	33.5	49.0

30	Male	2.8	35.0	50.0
31	Female	2.9	34.0	48.6
32	Female	3.2	34.5	50.2
33	Female	2.8	33.5	48.9
34	Female	2.2	34.0	48.0
35	Male	2.8	35.6	50.0
36	Female	2.7	33.5	49.2
37	Female	3.0	33.8	50.2
38	Male	3.25	35.6	51.4
39	Female	2.8	33.0	47.8
40	Male	2,7	34.0	48.4
41	Male	2.5	33.5	48.0

Table 2: Cranial Index

Foetus number	Maximum cranial breadth in cms	Maximum cranial length in cms	Cranial index
1	9.0	10.5	85.70
2	8.6	11.4	75.40
3	8.0	11.0	72.72
4	7.8	11.0	70.90
5	9.0	11.0	81.81
6	8.5	10.5	80.95
7	10.5	11.0	95.45
8	7.8	10.0	78.00
9	7.5	9.8	76.53
10	8.0	9.5	84.21
11	8.0	10.8	74.07
12	8.4	11.0	76.36
13	7.9	10.5	75.24
14	8.6	11.0	78.18
15	7.4	10.0	74.00
16	8.0	10.0	80.00
17	10.4	11.2	92.86
18	9.0	11.0	81.82
19	9.2	11.4	80.70
20	8.0	9.5	84.21
21	8.0	11.0	72.72
22	7.8	10.0	78.00
23	7.8	11.0	79.00
24	8.4	10.8	77.78
25	9.0	11.0	81.82
26	8.5	10.4	81.73
27	7.6	10.5	72.38
28	7.8	10.0	78.00
29	8.0	10.8	74.07
30	9.0	11.2	80.36
31	8.8	10.6	83.02
32	7.5	9.8	76.53
33	8.4	9.2	91.30
34	8.6	11.2	76.78
35	8.6	11.4	75.43

36	7.8	10.4	75.00
37	7.9	11.0	71.82
38	9.0	11.2	80.36
39	7.4	10.2	72.55

Mean value - 78.709

SD = 5.791; SE = 0.3853; 95% C.I =78.709 ± 0.7553

Table 3: Sagittal positioning of IAM

Foetus number	Cranial index	Average distance of IAM from porion (in cms)	Sagittal positioning of IAM
1	85.70	3.20	3.73
2	75.40	2.90	3.85
3	72.72	2.70	3.71
4	70.90	2.55	3.59
5	81.81	3.30	4.03
6	80.95	2.90	3.58
7	95.45	3.40	3.56
8	78.00	2.70	3.46
9	76.53	2.70	3.53
10	84.21	2.70	3.21
11	74.07	2.60	3.51
12	76.36	2.80	3.67
13	75.24	2.60	3.46
14	78.18	2.90	3.70
15	74.00	2.50	3.38
16	80.00	2.60	3.25
17	92.86	3.35	3.61
18	81.82	3.20	3.91
19	80.70	3.20	3.96
20	84.21	2.75	3.27
21	72.72	2.70	3.71
22	78.00	2.60	3.33
23	79.00	2.65	3.73
24	77.78	2.80	3.60
25	81.82	3.00	3.67
26	81.73	2.90	3.54
27	72.38	2.55	3.52
28	78.00	2.60	3.33
29	74.07	2.80	3.78
30	80.36	3.20	3.98
31	83.02	3.20	3.85
32	76.53	2.50	3.01
33	91.30	2.80	3.06
34	76.78	2.80	3.65
35	75.43	2.80	3.71
36	75.00	2.60	3.46
37	71.82	2.60	3.62
38	80.36	3.20	3.98
39	72.55	2.50	3.45

Mean value - 3.588

SD = 0.245; SE = 0.079; 95% C.I =3.588 ± 0.1556

Table 4: Coronal positioning of IAM

Foetus number	Cranial index	Average distance of IAM from porion in coronal plane in cms	Coronal positioning of IAM
1	85.70	0.80	0.93
2	75.40	0.95	1.25
3	72.72	0.90	1.23
4	70.90	0.90	1.26
5	81.81	0.90	1.10
6	80.95	0.80	0.99
7	95.45	0.90	0.94
8	78.00	0.80	1.02
9	76.53	0.80	1.04
10	84.21	0.80	0.95
11	74.07	0.80	1.08
12	76.36	0.90	1.18
13	75.24	0.80	1.06
14	78.18	0.90	1.15
15	74.00	0.80	1.08
16	80.00	0.80	1.00
17	92.86	0.95	1.03
18	81.82	0.90	1.09
19	80.70	1.00	1.24
20	84.21	0.75	0.89
21	72.72	0.85	1.17
22	78.00	0.80	1.02
23	79.00	0.90	1.27
24	77.78	0.85	1.09
25	81.82	0.90	1.10
26	81.73	0.90	1.10
27	72.38	0.80	1.10
28	78.00	0.80	1.03
29	74.07	0.80	1.08
30	80.36	0.90	1.12
31	83.02	0.90	1.08
32	76.53	0.80	1.04
33	91.30	0.75	0.82
34	76.78	0.90	1.17
35	75.43	1.00	1.32
36	75.00	0.95	1.27
37	71.82	0.95	1.32
38	80.36	0.90	1.12
39	72.55	0.80	1.10

Mean value - 1.098

SD = 0.116; SE = 0.0538; 95% C.I =1.098 ± 0.9055

Table 5: Horizontal positioning of IAM

Foetus number	Cranial index	Average height of IAM from porion in in cms	Horizontal positioning of IAM
1	85.70	0.40	0.47
2	75.40	0.35	0.46
3	72.72	0.30	0.41
4	70.90	0.30	0.42
5	81.81	0.40	0.49
6	80.95	0.35	0.43
7	95.45	0.50	0.52
8	78.00	0.30	0.38
9	76.53	0.30	0.39
10	84.21	0.35	0.42
11	74.07	0.35	0.47
12	76.36	0.35	0.46
13	75.24	0.30	0.40
14	78.18	0.35	0.45
15	74.00	0.30	0.41
16	80.00	0.35	0.44
17	92.86	0.50	0.54
18	81.82	0.40	0.49
19	80.70	0.45	0.56
20	84.21	0.30	0.36
21	72.72	0.30	0.41
22	78.00	0.30	0.38
23	79.00	0.30	0.42
24	77.78	0.35	0.45
25	81.82	0.40	0.49
26	81.73	0.35	0.43
27	72.38	0.30	0.41
28	78.00	0.30	0.38
29	74.07	0.35	0.47
30	80.36	0.40	0.50
31	83.02	0.40	0.48
32	76.53	0.30	0.39
33	91.30	0.35	0.38
34	76.78	0.35	0.46
35	75.43	0.35	0.46
36	75.00	0.30	0.40
37	71.82	0.30	0.42
38	80.36	0.40	0.50
39	72.55	0.30	0.41

Mean value - 0.441

SD = 0.048; SE = 0.1063; 95% C.I = 0.441 ± 0.2084

Table 6: Percentage ratio of entry point to cranial index

Foetus number	Cranial index	Average distance of EP from SP in cms	Percentage ratio of entry point to cranial index
1	85.70	2.0	2.33
2	75.40	2.4	3.18
3	72.72	2.8	3.85
4	70.90	3.2	4.51
5	81.81	2.0	2.44
6	80.95	3.2	3.95
7	95.45	2.0	2.09
8	78.00	2.8	3.59
9	76.53	2.4	3.14
10	84.21	2.0	2.37
11	74.07	2.31	3.12
12	76.36	2.37	3.11
13	75.24	1.94	2.58
14	78.18	2.17	2.78
15	74.00	2.16	2.92
16	80.00	2.76	3.45
17	92.86	2.79	3.01
18	81.82	2.93	3.58
19	80.70	2.50	3.10
20	84.21	2.11	2.51
21	72.72	2.16	2.98
22	78.00	2.15	2.75
23	79.00	2.19	3.10
24	77.78	2.33	3.00
25	81.82	2.00	2.45
26	81.73	2.23	2.73
27	72.38	2.06	2.85
28	78.00	2.27	2.92
29	74.07	2.48	3.35
30	80.36	2.72	3.39
31	83.02	3.15	3.80
32	76.53	2.23	2.92
33	91.30	2.96	3.25
34	76.78	2.40	3.12
35	75.43	2.90	3.85
36	75.00	2.51	3.35
37	71.82	2.69	3.75
38	80.36	2.50	3.11
39	72.55	2.18	3.01

Mean value - 3.11

SD = 0.507; SE = 0.0114; 95% C.I =3.11 ± 0.2234

Table 7: Percentage ratio of IAM angle to cranial index

Foetus number	Cranial index	Average SP, EP, IAM angle in degrees	Percentage ratio of IAM angle to cranial index
1	85.70	42	49
2	75.40	38	50.39
3	72.72	30	41.25
4	70.90	45	63.47
5	81.81	32	39.11
6	80.95	40	49.41
7	95.45	30	33.17
8	78.00	32	41.02
9	76.53	38	49.65
10	84.21	32	38.00
11	74.07	36	48.60
12	76.36	37	48.45
13	75.24	32	42.53
14	78.18	38	48.60
15	74.00	34	45.94
16	80.00	35	43.75
17	92.86	41	44.15
18	81.82	40	48.81
19	80.70	38	47.08
20	84.21	37	43.83
21	72.72	35	48.24
22	78.00	33	42.30
23	79.00	34	47.95
24	77.78	33	42.42
25	81.82	35	42.78
26	81.73	34	41.60
27	72.38	32	44.41
28	78.00	34	43.59
29	74.07	36	48.60
30	80.36	33	41.06
31	83.02	41	49.29
32	76.53	35	45.73
33	91.30	37	40.83
34	76.78	34	44.28
35	75.43	30	39.77
36	75.00	36	48.00
37	71.82	29	40.38
38	80.36	41	51.03
39	72.55	35	48.24

Mean value - 45.30

SD = 5.043; SE = 0.3595; 95% C.I =45.30 ± 0.7046

Table 8: Percentage ratio of depth of IAM to cranial index

Foetus number	Cranial index	Average depth of IAM from EP	Percentage ratio of depth of IAM
1	85.70	3.40	3.96
2	75.40	4.00	5.30
3	72.72	3.20	4.40
4	70.90	2.00	2.82
5	81.81	3.20	3.91
6	80.95	2.80	3.46
7	95.45	4.20	4.40
8	78.00	3.50	4.48
9	76.53	3.00	3.92
10	84.21	4.02	4.98
11	74.07	2.19	2.95
12	76.36	2.63	3.45
13	75.24	4.06	5.40
14	78.18	3.76	4.81
15	74.00	3.88	5.25
16	80.00	3.12	3.90
17	92.86	3.95	4.25
18	81.82	3.60	4.40
19	80.70	4.15	5.15
20	84.21	4.08	4.85
21	72.72	3.09	4.25
22	78.00	3.50	4.49
23	79.00	2.78	3.92
24	77.78	2.99	3.85
25	81.82	3.21	3.92
26	81.73	3.15	3.85
27	72.38	3.56	4.92
28	78.00	2.58	3.31
29	74.07	2.85	3.85
30	80.36	3.55	4.42
31	83.02	2.89	3.49
32	76.53	2.48	3.25
33	91.30	3.58	3.92
34	76.78	3.22	4.19
35	75.43	3.43	4.55
36	75.00	3.34	4.45
37	71.82	2.53	4.35
38	80.36	2.29	2.85
39	72.55	2.32	3.20

Mean value - 4.13

SD = 0.677; SE = 0.1318; 95% C.I = 4.13 ± 0.2582

Observation

The cranial indices of foetuses (Table II) - Mean Value = 78.709**,** S.D = 5.791**,** S.E = 0.3853**,** 95% C.I = 78.709 ± 0.7553

Sagittal positioning of the Internal Acoustic (Table III) - Mean Value = 3.588

S.D = 0.245, S.E = 0.079, 95% C.I = 3.588 ± 0.1556

Coronal positioning of Internal Acoustic Meatus in Various Fetuses (Table IV) - Mean Value = 1.098
S.D = 0.116, S.E = 0.0538, 95% C.I = 1.098 ± 0.1055

Horizontal positioning of Internal Acoustic Meatus in Various Fetuses (Table V) - Mean Value = 0.441
S.D = 0.048, S.E = 0.1063, 95% C.I = 0.441 ± 0.2084

Having marked the surface point with the help of the constants derived from the above formulae, surgical approach to the IAM was attempted in 39 foetal heads. The measurement taken into consideration for locating the point of entry to internal acoustic meatus is

1. The distance of entry point from anatomical surface point in the horizontal plane on the surface.
2. The angle of passage of the needle to IAM [the angle between the surface point (SP), internal acoustic meatus(IAM) and entry point (EP)].
3. Depth is the distance of IAM from entry point.

Percentage ratio of the entry point to cranial index (Table VI)
The mean value -3.11
S.D = 0.507
S.E = 0.0114
95% C.I. = 3.11 +/- 0.2234

Percentage ratio of IAM angle to cranial index (Table VII)
The mean value - 45.3
S.D = 5.043
S.E = 0.3595
95% C.I. = 45.30 +/- 0.7046

Percentage of ratio of depth of IAM to cranial index (Table VIII)
Mean value = 4.13
S.D = .677
S.E = 0.1318
95% C.I. = 4.13 +/- 0.2582

With the help of constants thus obtained internal acoustic meatus can therefore be reached by making use of the following formulae in any given fetal skull (Fig. 8)

$$\text{Distance of the entry point From surface point} = \frac{3.11 \times \text{Cranial Index}}{100}$$

$$\text{Angle of passage} = \frac{45.3 \times \text{Cranial Index}}{100}$$

$$\text{Depth of IAM from Entry point} = \frac{4.13 \times \text{Cranial Index}}{100}$$

The validity of the constants derived to arrive at the internal acoustic meatus from the surface was verified in 39 fetal craniums and in two intact fetal heads (Fig. 5) It was possible to reach at IAM using this method in all 41 fetal heads.

To find the statistical significance of the values obtained, 95% C.I (Confidence Interval) is obtained by using the formula C.I = X ± 1.96 S.E.

Discussion

Intracranial causes infrequently result in isolated facial paralysis without other neurological signs. Astrocytomas, medulloblastomas and pontine glioma tumours of the posterior fossa can be present with cranial nerve neuropathy accompanied by facial paralysis.

Early diagnosis of acoustic neurinomas while they are still relatively small has become possible due to increased awareness of the neoplasm and due to the development of computed tomography and magnetic imaging techniques. Tumours localized to the internal auditory canal (IAC) are now seen more frequently than before.

Consequently tumour removal with possible preservation of hearing has become a subject of debate. Acoustic neurinomas confined to the cistern are rare. They nearly always extend into the IAC and the Surgeon has to open the IAC by drilling from the porus to the fundus for efficient tumours removal. The translabyrinthine route, which otherwise would seem to be a natural choice is obviously not applicable when the goal is to save hearing. Either a middle fossa or a sub occipital route gives access to the tumour without having to open the labyrinth.

The latter approach has been used. House & Hitsellberger (1976) report on four patients in whom a new approach to the base of the skull is described. He calls it the transorbital approach to the skull base. The facial nerve has to be dissected out most carefully in order to avoid damage. Occasionally if it is found to be involved in a tumour, the nerve cannot be preserved. Portman et al. (1975) give great detail on all aspects of

surgery in the region of the internal auditory meatus.

A separate surface marking of the IAM for any surgical procedures is required to avoid the petrous temporal substance. The entry point is the point at which the burr hole has to be made to reach the internal auditory meatus (IAM).

The surgical positioning of the needle requires the point of entry, angle of passage and depth. This has been worked out in the present work and the constants derived are made use to determine the way a biopsy needle or diathermy can be passed to reach the IAM, to take the biopsy of the tumour or for electrocoagulation. Anatomy of the internal acoustic canal (IAM) is necessary during evaluation of temporal bone trauma, congenital anomalies affecting the individual nerves, and some neuro-otologic surgeries

Conflict of Interest: None
Source of Support: Nil

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