전산화단층촬영상 소아의 측두골 계측

고의경 · 윤종근 · 이일우 · 노환중 · 왕수건 · 전경명

Measurement of Pediatric Temporal Bone Using CT Scan

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－ ABSTRACT －

Background and Objectives　Radiographic imaging of the temporal bone is invaluable to the otologic surgeon contemplating cochlear implantation. HRCT scanning technology has increased the ability to assess the structures within the petrous pyramid. This study was performd to obtain anatomical data of developing temporal bone for pediatric cochlear implantation and to determine the normal course of skull and temporal bone development for the proper time of age for implantation. **Materials and Methods**　High-resolution temporal bone computed tomographic (CT) images of 56 patients were measured and analysed. Patients are aged from 1 to 19 years old. Using parameters are dimension of temporal bone, predictor for cochlear implantation, major feature, and cochlear ossification. **Results**　The growth of the skull and the Temporal bone was rapid during the first 5 years of life followed by gradual but steady development until the age of 15. Each portion of the Temporal bone was different in developmental rate and thickness of soft tissue covering temporal bone was variable. Also thickness of parietal bone, pneumatization and the size of facial recess was measured variably. No inner ear malformation and cochlear ossification was noticed radiologically. **Conclusion**　The results of analysis of temporal bone development will be utilized as anatomical data base for pediatric cochlear implantation. **(J Clinical Otolaryngol 1999;10:195-201)**

KEY WORDS　Temporal bone CT · Cochlear implantation · Pediatric.

서　　론

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(HRCT)　　　　　　　　(petrous pyr-
amid)

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1 mm   .   2

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Siedman   1)   CT

78%   22%

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CT   53%

.   **대상 및 방법**

,   1993   1995

56   ,
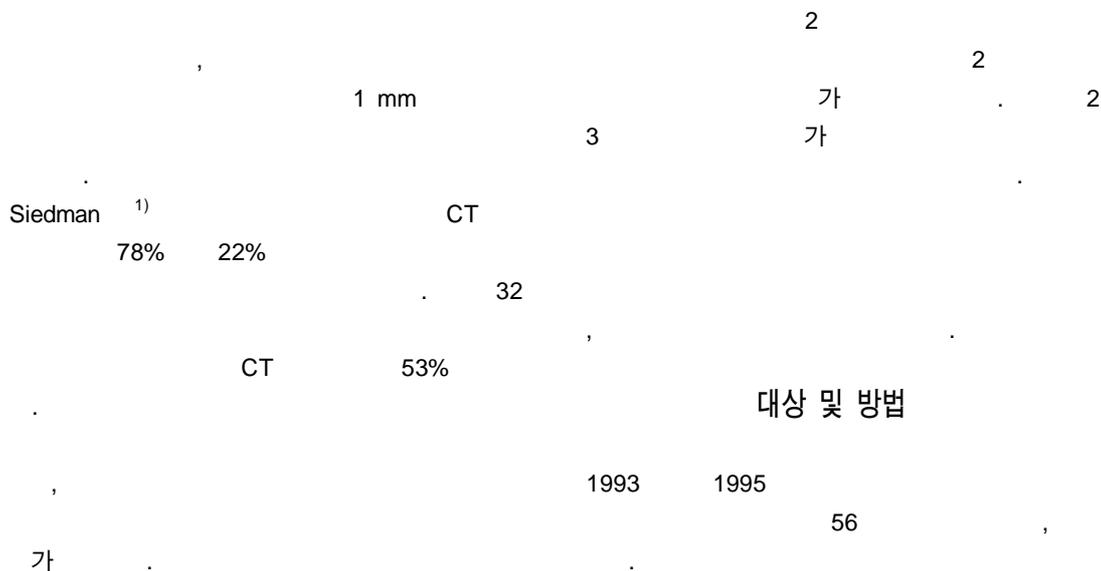
.   .

Table 1. Criteria of measurement

Dimension of temporal bone

　D1- 두개골외경(두부전체의 발육의 지표로 되는 두개골의 외경)

　D2- 측두골 자체의 크기
　　와우내에 삽입하는 전극과 측두골 매장부(체내 안테나와 발신기) 와의 거리를 대표로 하는 상반규관 전각과 여기서
　　S상 정맥동으로의 접선이 측두골 외측면과 교차하는 점과의 거리

　D3-
　　측두골에 인공내이를 매장하는 주된 부위가 되는, 측두골 외측면에서 S상 정맥동까지의 두께(함기봉소가 있는 경우
　　이점을 포함)

　D4- 그 직상의 측두부 연부조직의 두께

Predictor for cochlear implantation

　P1- thickness of the parietal bone for replacement of the receiver/stimulator

　P2- pneumatization

　P3- size of the facial recess

　P4- orientation of the facial recess

　P5- cochlear patency

Major feature

　M1- inner ear malformation

　M2- position of the jugular bulb whether it may reach up to the level of the round window

　M3- presence of retro/infracochlear air cells which may be mistaken as round window niche

Classification of cochlear ossification

　C1- no ossification

　C2- round window membrane ossified

　C3- ossification of the round window extending 0 to 2 mm into the scala tympani but coil patent

　C4- ossification at the round window extending 3 to 8 mm into the scala tympani with patent coil

　C5- diffuse cochlear ossification

대 상

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　　1　　19　　　　　　　34　22(1.5　S

1)　　　．

방 법

　Somatome Plus CT　　　　　1 mm slice　fine
section　　　　　　　　SOMARIS
　　　　　　　　．　　　　　Wiet [2]
　　　　　　　　　　　　(Table 1)

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결　　과

Dimension of temporal bone(Table 2)
　Cochlear　　　22 Channel
　　　　4　　　　　　　　　　1)
　　　　　　　　　　(D1), 2)

Table 2. Results of dimension of temporal bone

Age	D1	D2	D3	D4
1	117.09± 9.51	29.96± 2.49	5.33± 1.33	5.75± 1.52
2	119.86± 6.29	30.89± 5.31	6.42± 1.67	4.76± 1.51
3	127.02± 6.94	32.74± 1.72	5.42± 2.26	5.29± 0.85
5	127.38± 6.01	34.74± 2.59	6.16± 0.61	4.99± 2.09
6	139.93± 9.00	36.85± 0.85	8.90± 7.92	5.88± 2.07
7	140.00± 3.56	37.80± 2.45	6.40± 2.15	6.90± 0.56
8	141.50± 2.90	16.55± 3.55	7.45± 2.33	6.55± 1.35
9	142.75± 5.85	37.25± 5.47	8.60± 1.65	7.45± 1.22
10	131.25± 3.28	36.25± 1.86	7.88± 1.76	5.36± 0.97
11	145.48± 5.03	39.77± 2.70	7.84± 3.34	6.73± 1.68
12	138.14± 11.29	37.82± 5.48	8.59± 3.23	6.11± 2.14
13	137.00± 2.16	37.64± 4.57	10.01± 2.72	6.69± 1.62
14	139.83± 1.99	37.85± 3.98	7.90± 1.22	5.02± 1.05
15	143.30± 11.20	36.71± 3.45	8.49± 1.04	5.30± 1.69
16	139.00± 5.78	37.66± 1.25	8.71± 2.02	6.91± 0.45
17	135.20± 0.42	31.03± 2.02	8.35± 0.21	4.38± 0.39
18	146.43± 4.66	37.33± 5.14	8.89± 0.22	6.02± 0.50
19	141.01± 2.08	37.55± 3.36	8.91± 1.44	5.17± 1.42

　　　　　　　　　　　　　　　S
　　　　　　　　　　(D2), 3)
　　　　　　　　　　　　　　，
　　　　　　　34　22(1.5　S　　　　(D3), 4)
　　　　　　　　　(D4)　　　　　　　　．
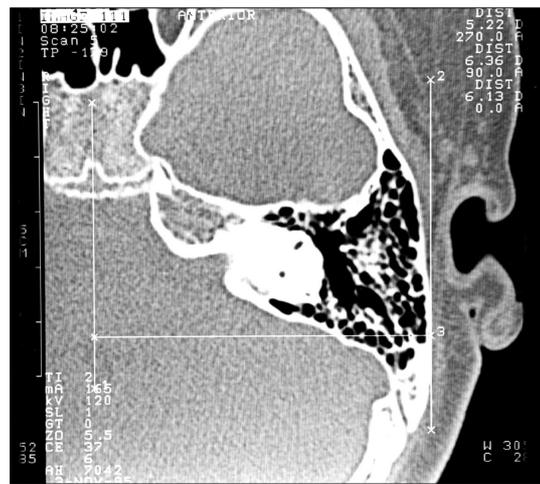　1)　　　　(D1, Fig. 1)　　　　1　15
　　　　　　　　　　1

Fig. 1. D1　External diameter of skull as index of development of head.

Fig. 2. D2　Size of temporal bone itself from anterior crus of superior semicircular canal to the most lateral aspect of sigmoid sinus.

1, 5, 10,
15   5.8± 1.5, 5.0± 2.1, 5.4± 1.0,
5.3± 1.7 mm   .   4~ 7

15 19

5

1 (117.1± 9.5 mm)   5 (127.4± 6.0 mm)
5   10.3 mm, 6 (140.0± 9.0 mm)
10 (131.3± 3.3 mm)   5   3.9 mm,
11 (145.5± 5.0 mm)   15 (143.3± 11.2 mm)
5   12.0 mm   2 3
5.1%, 6 7   8.9%   .

2)   (D2, Fig.
2)   1 (30.0± 2.5 mm)   5 (34.7± 2.6 mm)
5   4.7 mm, 6 (36.9± 0.9 mm)   10
(36.3± 1.9 mm)   1.6 mm, 11 (39.8± 2.7 mm)
15 (36.7± 3.5 mm)   0.4 mm

2 3   5.0%, 5 6   5.7%, 10~ 11
9.5%   .

3)   S   (D3, Fig. 3)   1
(5.3± 1.3 mm)   5 (6.2± 0.6 mm)   0.9 mm,
6 (8.9± 7.9 mm)   10 (7.9± 1.8 mm)   5
2.7 mm, 11 (7.8± 3.3 mm)   15 (8.5±
1.1 mm)   0.6 mm   .

4)   (D4, Fig. 4)

Fig. 4. D4 Thickness of soft tissue of mastoid portion.

Table 3. Results of predictor for cochlear implantation

Age	P1	P3 (Neck)	P3 (Fundus)
1	2.14± 1.10	0.85± 0.49	1.36± 0.49
2	3.95± 1.00	1.97± 0.66	2.52± 0.71
3	4.34± 1.84	1.79± 0.43	2.56± 0.62
4	5.41± 1.40	0.83± 0.77	1.43± 0.46
5	4.62± 1.38	2.03± 0.91	2.15± 1.17
6	5.07± 1.42	1.83± 0.60	2.03± 0.81
7	6.00± 0.68	2.00± 0.12	1.80± 0.39
8	5.77± 1.88	1.55± 0.85	2.01± 0.95
9	4.97± 1.06	1.34± 0.36	1.85± 0.66
10	5.00± 0.49	2.00± 0.15	3.13± 0.75
11	5.95± 0.33	1.61± 0.71	2.20± 0.63
12	5.41± 1.04	1.88± 0.85	2.27± 0.52
13	5.86± 0.34	1.29± 0.78	1.93± 0.64
14	6.13± 0.65	1.17± 0.12	1.60± 0.52
15	5.39± 1.29	1.41± 0.48	1.93± 0.36
16	5.89± 0.67	1.03± 0.04	1.32± 0.33
17	6.10± 0.64	1.35± 0.42	2.05± 0.14
18	5.61± 0.88	1.77± 0.49	2.30± 0.33
19	5.50± 0.06	0.91± 1.08	1.72± 0.54

Fig. 3. D3 Thickness of the lateral portion of temporal bone.

Fig. 5. P3 Size of facial recess. It was measured as precisely as possible by control of window level of CT scan It is divied into neck and fundus.

Fig. 6. M2 Position of jugular bulb was measured as the shortest distance from hypotympanum to jugular bulb. We noticed whether it may reach up to the round window level.

Predictor for cochlear implantation(Table 3)

/　　　　　　　　　　　　　　(P1),
(P2), facial recess　　　(P3)　　　(P4),
　　　　(P5)　　　　　　　.
　　　　(P1)

　　　　　　　　　　　　　　7

　　　　　　　　　　　.
　　　(Facial recess, P3, Fig. 5)

Fig. 7. M3 Presence of retro/infracochlear air cells which may be mistaken as round window niche.

　　　window level 500　1000 HU, window width
4000 HU　　　　window level　　　　　　　　　.
　　　(Cochlear patency, P5)

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Major feature

　　　　　　　　　　　(M1)
　　　(M2, Fig. 6)
　　　1 mm　　　　　　　　11　(19.6%)
　　/　　　　(M3, Fig. 7)　7　(12.5%)
　　　　.

Classification of cochlear ossification

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"   William   4)   10

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.3)

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.   Paget   ,   , Cogan

.   Cochlear   .5)

4 mm

(spiral gang-

,   lion cell)

.   .   Steenerson   6)

, Gantz

Michel malformation   7)

(radical cochleotomy)   .

Cohen   8)

,   ,   ,   (1.2%)

(   ),   (1.3%)

,   ,   -

.   ,   ,   ,

(extracochlear device)   .   .

,

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Wiet   2)   28   ,   ,

88%   .   ,

,   .

,   (secondary tympanic membrane)   Yasushi   9)

,   2

.   3

. O′don-

(fibroblastic obliteration)   oughue   10)

.2)   3

Yasushi   9)

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4 mm   S

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4)   56

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