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4

16

1.

2.

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3.

1.13mm (0.75

1.59),

가

5.37mm (4.53 6.07) .

6.06mm (4.72 7.46) .

4. (11),
(2), 가
(3) .

5. Huguier 가
(9 , 56.3%) 가
(7 , 43.7%) .

6. ,

7. 가 가
8.40mm (6.62 11.42) ,
2.01mm (1.25 3.02) .

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가 가
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가 가 가 .

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L

(temporomandibular joint, TMJ) 가
가 (diarthroidal joint) (articular disk)
가
(compound synovial joint) (O'Rahilly Gardener, 1976).
articulare quadrate bone
(Symons, 1952).
(Kjellberg, 1904; Harpman Woollard, 1938; Furstman, 1963; Yuodelis, 1966;
Baume Holtz, 1970; Perry , 1985; Wong , 1985; , 1992;
, 1996). 가
(Cameron, 1915; Burch, 1966;
Coleman, 1970; Couly Hureau, 1976). 가
(Pinto, 1962;
Coleman, 1970; Toledo Filho , 1985; Loughner , 1989; Rodriguez Vazquez ,
1992; Ogutcen-Toller, 1995; Loughner , 1997; Rodriguez Vazquez , 1998).
가 (discomalleolar ligament,
DML) (condyloctomy) 가

가 (Loughner, 1989).

가 , , 가
(Ogutcen-Toller Jupiter, 1993). 가
가 .

가
(discotemporal muscle bundle) (Akita , 2000), (sphenomandibular
ligament, SML) 가 (Loughner , 1997)

가

가

(anterior malleolar
ligament) -

II.

1.

16 (13, 3;
69) . 10
, 6 .
5 4 .
(Carl Zeiss, Germany) .

2.

가.

Pinto (1962) Akita (2000)
(middle cranial fossa)
(petrous portion) . ,
micromotor Bur (# 1, 4, 8) (superior
compartment) .
(malleus) (incus),
(Fig. 1).

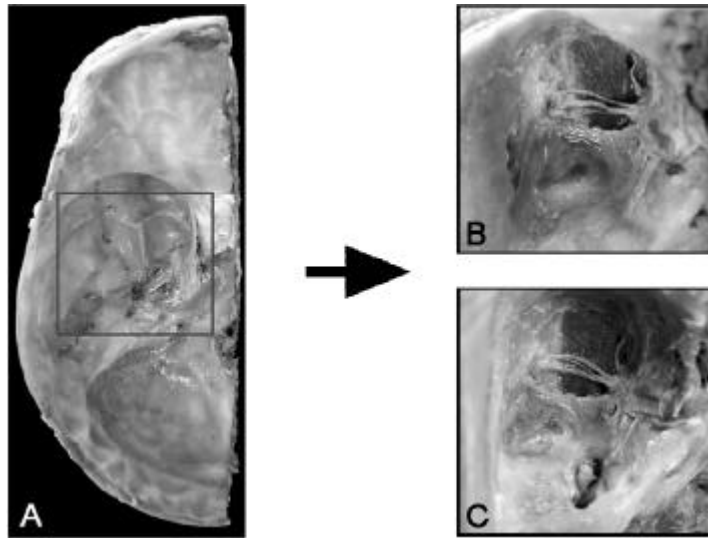


Fig. 1. The serial dissections of the middle cranial fossa. The dissection was performed in the outlined region of the middle cranial fossa (A). The bone above the mandibular fossa region (B) and superior wall of tympanic cavity (C) were removed.

가

(upper compartment) (articular capsule) (retrodiscal tissue)

가 가

(sphenomandibular ligament) (infratemporal fossa)

(manubrium of malleus) 가

(chorda tympani canal)

가

가

(thick),

(thin),

(very thin)

가

(discernible) ,

가

(indiscernible)

(Mitutoyo

Co., Japan)

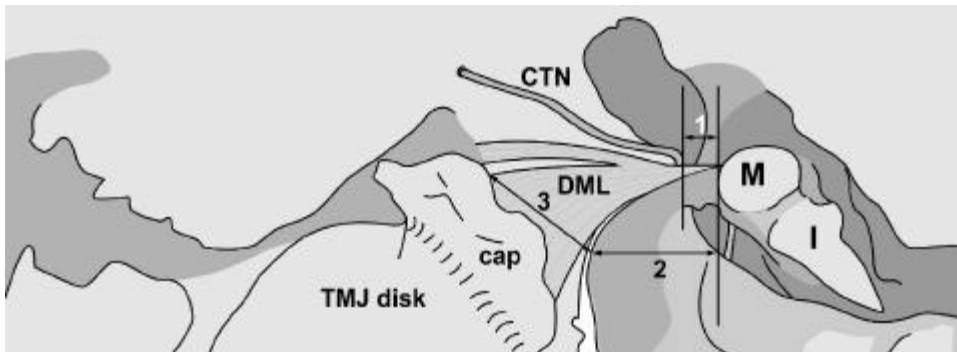
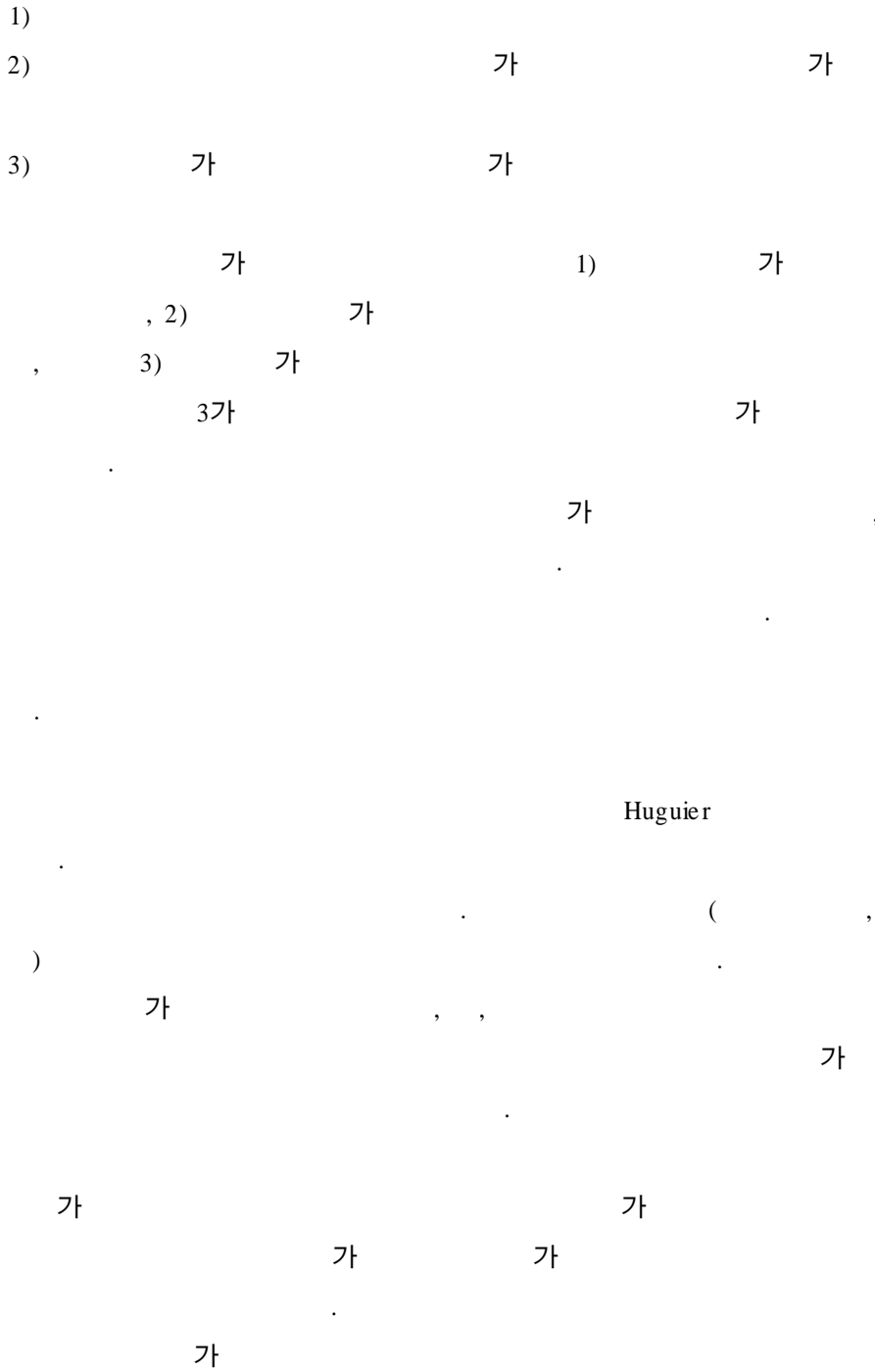


Fig. 2. Items of measurements of discomalleolar ligament related with surrounding structures on the dissected specimen (1: Distance between the anterior margin of the malleus and the anterior limit of the tympanic cavity, 2: Distance between the anterior margin of the malleus and anterior limit of the discomalleolar ligament at the petrotympanic fissure region, 3: Width of the dicomalleolar ligament at the the dicomalleolar ligament, CTN: chorda tympani nerve, cap: capsule of the temporomandibular joint, TMJ: temporomandibular joint).

(Fig. 2)



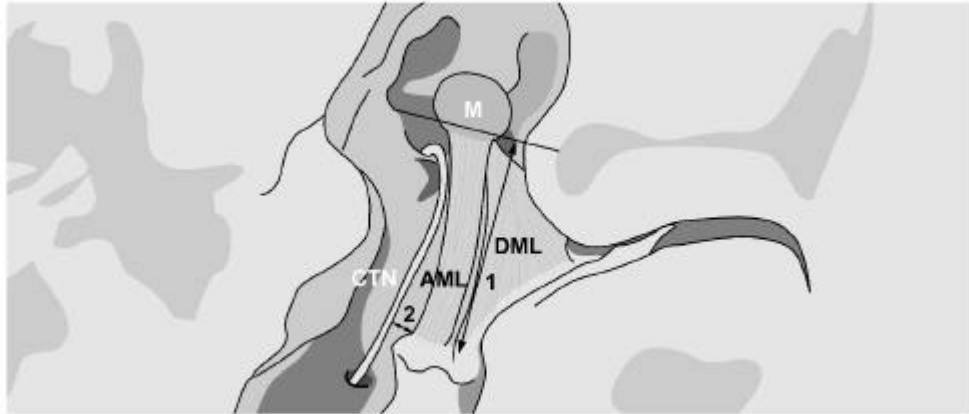


Fig. 3. Items of measurements of anterior malleolar ligament related with surrounding structures on the dissected specimen (AML: anterior malleolar ligament, DML: discomalleolar ligament, CTN: chorda tympani nerve, M: malleus, 1: distance from the anterior aspect of the malleus to the exit point of the anterior malleolar ligament on the petrotympanic fissure, 2: the shortest distance between the anterior malleolar ligament and the chorda tympani nerve).

III.

1.

4

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, , 가 .
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가 가
(Fig. 4).
가

(Fig. 4).

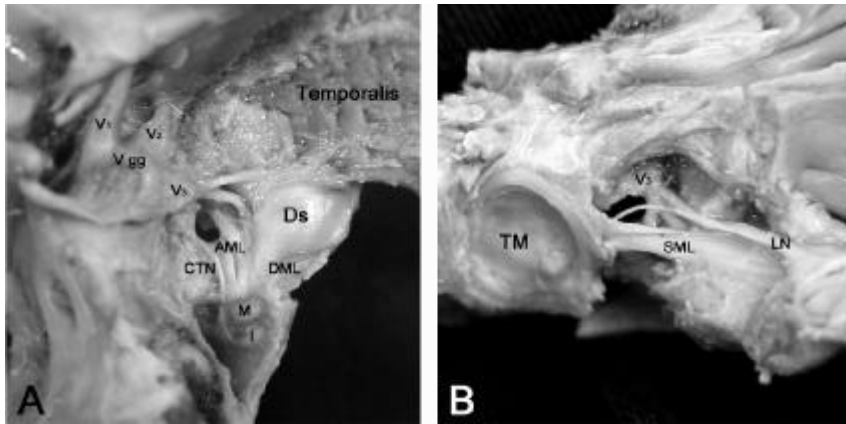


Fig. 4. Superior view of the middle cranial fossa (panel A) and internal view of the infratemporal fossa (panel B) of the dissections of the 5 month old fetal heads (M: malleus, I: incus, Ds: disk of the TMJ, DML: discomalleolar ligament, AML: anterior malleolar ligament, CTN: chorda tympani nerve, Vgg: trigeminal ganalion, V1: ophthalmic division of trigeminal nerve, V2: maxillary division of trigeminal nerve, V3: mandibular division of trigeminal nerve, TM: tympanic membrane, SML: sphenomandibular ligament, LN: lingual nerve).

2.

가 .
가
7 (43.7%), 4 (25%),
5 (31.3%) .
가 16 11 가
5 (Fig. 5).

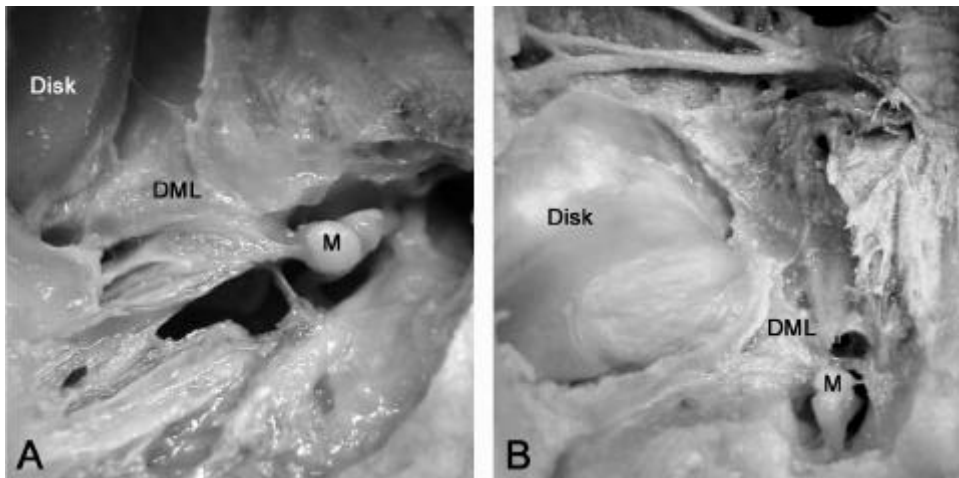


Fig. 5. Superior view of the middle ear and the temporomandibular joint disk through the middle cranial fossa. A distinguishable discomalleolar ligament (DML) are seen and connected between the malleus (M) and temporomandibular joint disk (panel A). Whereas, indistinguishable discomalleolar ligament is observed in the panel B.

1.59) , 1.13mm (0.75 가
 5.37mm (4.53 6.07) .
 6.06mm (4.72 7.46)

(Table 1).

Table 1. Measurements of discomalleolar ligament with references of surrounding anatomical structures.

Items of measurement	measurements (n=16)
anterior surface of malleus	1.13±0.28mm
anterior wall of tempanic cavity	
anterior surface of malleus	5.37±0.49mm
exit point of DML at the PTF	
width of DML at the PTF	6.06±0.72mm

Average ± standard deviation

DML: discomalleolar ligament, PTF: petrotympanic fissure

(11 , 68.7%),
 (2 , 12.5%),
 가
 (3 , 18.8%) (Fig. 6).
 가 8 (50%)
 , 가 5
 (31.3%), 가 가 3 (18.7%)

(Fig. 7).

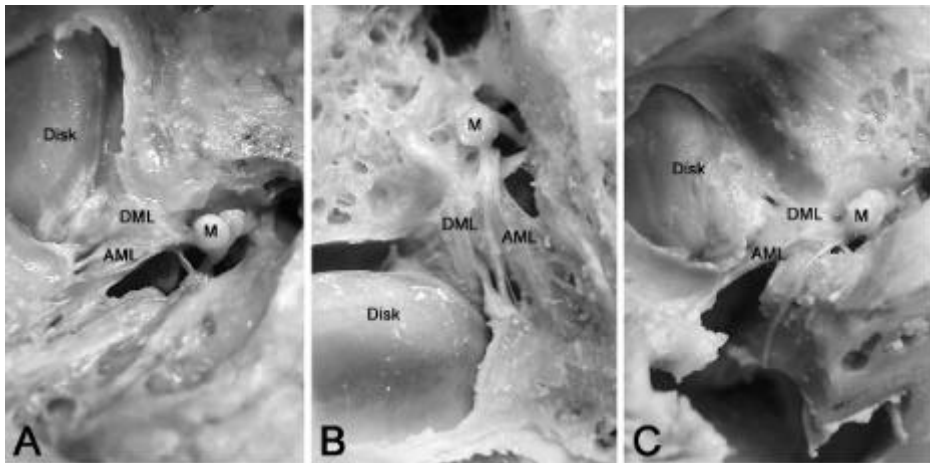


Fig. 6. Classifications of the discomalleolar ligament (DML) according to the posterior attachment sites to the malleolar head. In panel A, DML is attached to the malleolar head directly and DML is attached to the malleolar head indirectly via anterior malleolar ligament (AML) in panel B. In panel C, DML is directly attached and indirectly attached to the malleolar head (DML: discomalleolar ligament, AML: anterior malleolar ligament, M: malleus).

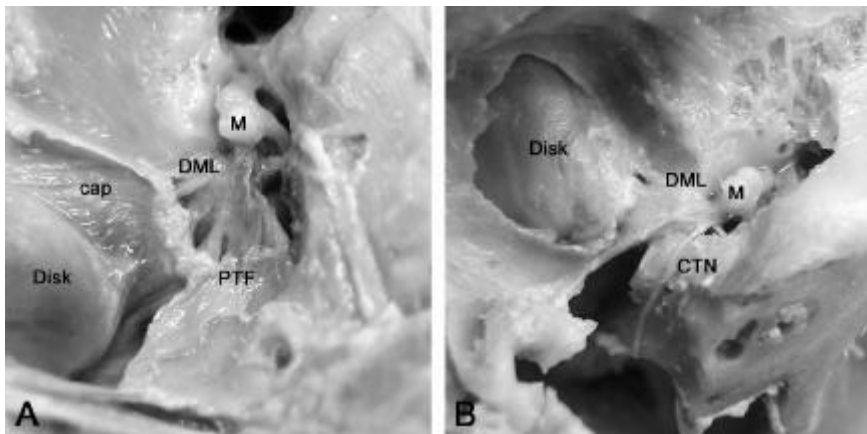


Fig. 7. Anterior attachments of the discomalleolar ligament (DML). In all specimens, DML were attached to the temporomandibular joint disk and capsule as seen in panel A. Concurrently, DML is attached to the anteromedial border of the petrotympanic fissure (panel B) (M: malleus, DML: discomalleolar ligament, PTF: petrotympanic fissure, CTN: chorda tympani nerve, cap: temporomandibular joint capsule).

3.

16 가 9 가 Hugnier (56.3%), 가 7 (43.7%) (Fig. 8).

가 . 4

(Fig. 9).

가 , 12 (Fig. 10).

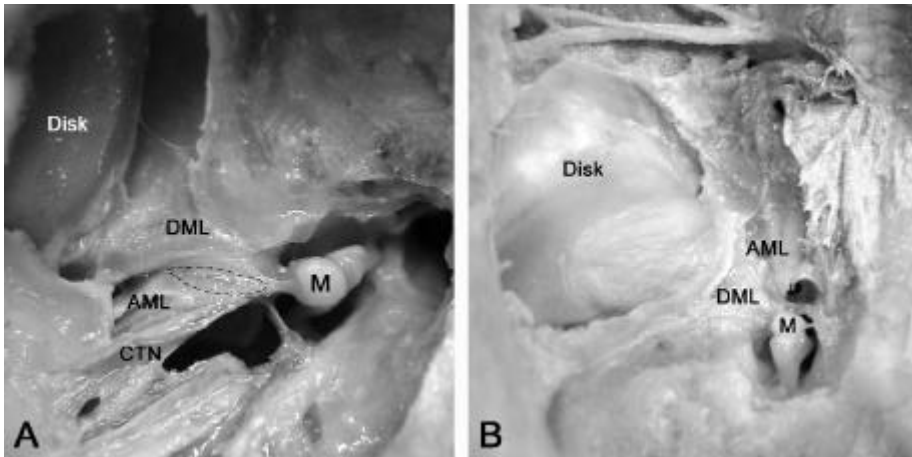


Fig. 8. Two patterns of the anterior malleolar ligament according to the presence of the bony ridge on the Huguier's canal in the petrotympanic fissure. DML and AML are observed separately by the bony ridge (dotted area) in panel A. In panel B, fusion of the DML and AML is observed (M: malleus, DML: discomalleolar ligament, AML: anterior malleolar ligament, CTN: chorda tympani nerve).

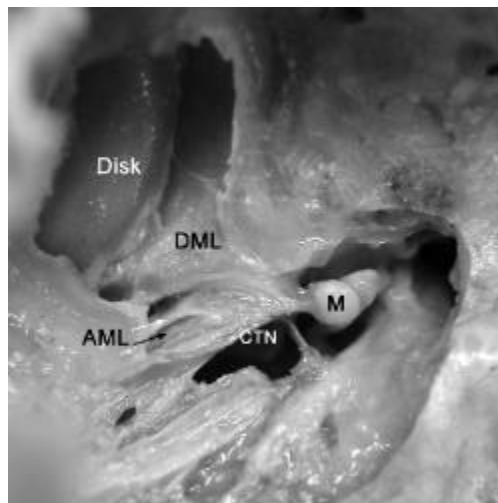


Fig. 9. Superior view of the middle ear and temporomandibular joint disk showing the two lamellae of the anterior malleolar ligament. Two distinct superior (white arrow) and inferior (black arrow) lamellae were observed. Superior lamella is running from the malleolar head to the anteromedial border of the petrotympanic fissure. And inferior lamella is entering the gap in the petrotympanic fissure and continuous to the sphenomandibular ligament (M: malleus, DML: discomalleolar ligament, AML: anterior malleolar ligament, CTN: chorda tympani nerve).

가 가
 8.40mm (6.62 11.42) ,
 2.01mm (1.25 3.02) .
 , 5

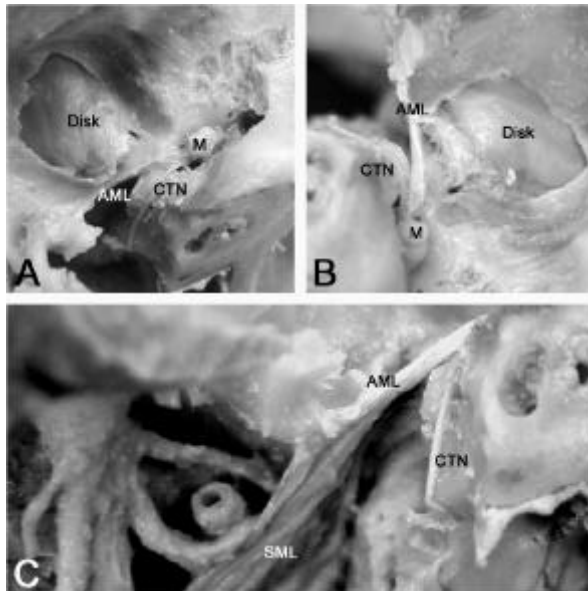


Fig. 10. Various views of photographs showing the connection between the anterior malleolar ligament and sphenomandibular ligament. On the superomedial view (panel A) and posteromedial view (panel B) of the dissections, anterior malleolar ligament is attached to the anteromedial border of the petrotympanic fissure. On the inferomedial view of the dissection (panel C), anterior malleolar ligament is continued to the sphenomandibular ligament in the infratemporal fossa (M: malleus, AML: anterior malleolar ligament, SML: sphenomandibular ligament, CTN: chorda tympani nerve).

IV.

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가 가
(Hanson , 1962; Strickland , 1962; Beck , 1973; Enlow, 1982).

, 가 가
가
(Furstman, 1963; Yuodelis, 1966).

. ,
가
Harpman Woollard (1938)

,
Pinto (1962)
"tiny ligament" , ,

. 12
Komori (1986)

. 가 ,
5 가 (Fig. 5).

" " 가
가

(discomalleolar band) (Rees, 1954), (tiny ligament) (Pinto, 1962),
가 (Burch, 1966),
(discomalleolar ligament) (Coleman, 1970), (middle
and inferior fascicle of the anterior ligament of the malleus) (Toledo Filho ,
1985), (articular portion of the anterior ligament of
the malleus) (Cesarani , 1991)

가

가
(Komori , 1986)

가 가

(Rodriguez-Vazquez , 1998).

가

가

(Fig. 6).

, (Komori , 1986)
31.3% , 16
9 Huguier 가

(Fig. 8),

1

(Fig. 11).

Huguier , (mandibular fossa)

(Fig. 11-A).

Huguier

가

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가

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가

(Fig. 11-B).

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가

가

가

가

(Fig. 11-C).

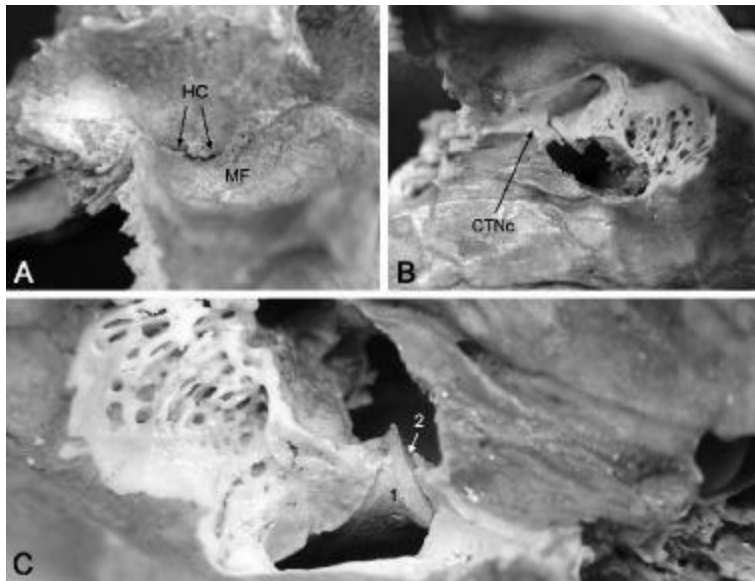


Fig. 11. Huguier's canal in dry temporal bone. On the anterosuperior view of the temporal bone (panel C), triangular DML portion for DML (1) and linear portion for AML (2) is separated by the bony ridge (HC: Huguier's canal, MF: mandibular fossa, CTNc: chorda tympani canal).

가

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가

5.37mm

6.06mm

(Table 1).

Huguier

가

가

가

가 Huguier

가

(Fig. 7, panel B).

Ogutcen-Toller (1995)가

가

(Fig. 7).

가

가

, Rodriguez-Vazquez (1992)

가

(Toledo Filho , 1985; Komori , 1986; Cesarani, 1991; Rodriguez-Vazquez , 1993; Ogucten-Toller, 1995)

가

(Fig. 10).

(Toledo Filho

, 1985)

, Toledo Filho (1985)

가 (Fig. 9). , 가

(Fig. 9, 10). 가

(Fig. 11). , 가 가 가 , 가

(anterior disk displacement) 가 , 가 (Pinto, 1962; Ioannides, 1983; Toledo Filho, 1985)

가 Huguier (Coleman, 1970; Komori , 1986; Smeele, 1988; Loughner, 1989; Rodriguez Vazquez, 1998)

가 가

가

가

(Toledo Filho, 1985; Loughner, 1989; Rodriguez Vazquez, 1992). 16 , 5

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가

가

V.

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16

4

1.

2.

, Hugnier

가

가

3.

4.

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, :
5:167-185, 1992

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1996

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Abstract

Topographic anatomy of the discomalleolar and anterior malleolar ligament in human adults and fetuses

Kyoung - Sub Shim D.D.S.

Department of Dentistry, The Graduate School, Yonsei University

(Directed by Professor Hee - Jin Kim D.D.S., Ph.D.)

During temporomandibular joint (TMJ) formation, discomalleolar ligament (DML) and anterior malleolar ligament (AML) are formed within the dorsal end of the 1st branchial arch. But, DML is known as a remnant or the degenerated tissue through the TMJ development. There is few reports said that damage of AML and DML cause the damage of middle ear during surgical procedures. Especially, in case of anterior disk displacement of TMJ, aural symptom can be made via DML due to hyperextension anteriorly. A few studies have been reported about DML and AML in embryological and histological points of view, morphology and clinical aspects of DML and AML are still unclear. Four fetus and sixteen adult hemi-sectioned heads were dissected to clarify the topographical relationship of AML and DML and to find out the anatomico-clinical relevance related with temporomandibular disorder.

In fetal specimens, DML was firmly attached from the disk of the TMJ to the malleus. Also, AML in which distinguished into the superior and inferior lamellae was running anteriorly and continuous with the sphenomandibular ligament (SML) through the future petrotympanic fissure (PTF). DML attached to the malleus was observed in all adult specimens and was expanded broadly to the disk and capsule of the TMJ as shown the V shaped-ligament structures. The average distance between the anterior aspects of the malleolar head to the anterior wall of the tympanic cavity was 1.13mm (0.75 1.59), and the length of the DML from the anterior aspect of the malleolar head to the attached site to the TMJ capsule at the PTF was 5.37mm (4.53 6.07). The average width of the DML at the PTF was 6.06mm (4.72 7.46). Most of the posterior attachments of the DML were the cases in which DML was directly attached to the malleus (68.7%). In all specimens,

DML was attached to the disk and capsule of TMJ and attached to the anteromedial border of the PTF concurrently.

In this study, two morphological patterns of AML were observed according to the presence of the bony ridge on the Huguier's canal in the PTF. The bony ridge of the Huguier's canal showed DML and AML separately in 56.3%, and the fused pattern of DML and AML was observed in 43.7%. AML was not distinguished with two lamellae in most specimens, superior ligament fibers were attached to the anteromedial border of the PTF and most of the inferior lamella was entering the gap in PTF and continuous with the SML. Average length from the anterior aspect of the malleolar head to the exit point of the AML on the PTF was 8.40mm (6.62-11.42), and the shortest distance between the AML and chorda tympani was 2.01mm (1.25-3.02).

Taken all together, DML and AML were not the rudimentary, but the distinguishable structures in adults. Through the various morphological findings, DML and AML were separated ligamentous structures in which might be given rise from the divergent origin. And the anterior hyperextension of the disk of TMJ did not lead the movement of the malleus in the tympanic cavity, whereas, the movement of the malleus followed by the traction of the AML and SML was observed in a few cases. So, this results can be explained the possibility of the clinical symptom on the middle ear in case of the over-traction of the AML and SML.

Key words: discomalleolar ligament, anterior malleolar ligament, petrotympanic fissure, sphenomandibular ligament, chorda tympani nerve