

이관의 해부 및 생리

이 상 혼

Anatomy and Physiology of the Eustachian Tube

Sang Heun Lee, MD

Department of Otolaryngology, School of Medicine Kyungpook National University, Taegu, Korea

서 론

가

30~40°, (sagittal plane)

가

45°

31~38 mm

1/3

2/3

(isthmus)

(Osseous portion)

4

가 11~14 mm

(pharyngeal arch)

1

(carotid canal)

(first pharyngeal pouch)

1 2

가 2~3 mm,

1 (first branchial cleft)

3~4 mm

4 mm

1

160°

이관의 해부

Valsalva

1-3)

(Fibrocartilaginous portion)

기본 구조

가 20~25 mm

가

(slit)

lumen

: , 700 - 721

2가 50

: (053) 420 - 5784 · : (053) 423 - 4524

E - mail : leeshu@knu.ac.kr

(Shepherd's crook)

가 가

torus tubalis 가 8~10 mm, 2~5 mm
20 mm

2) (gland)

(Isthmus) 가 2~4 mm,

1 mm 가 (tensor tympani) 이관의 주위근육(Fig. 1)

이관의 점막구조

가 (pseudostratified ciliated columnar epithelium) (elastic coil)

가 (80%) (gob - let cell) 2)

가 (Tensor veli palatini muscle) bu -

가 ndle 가 bundle

가 (mucous blanket) (scaphoid fos -

가 (mucosal fold) sa) (hamulus)

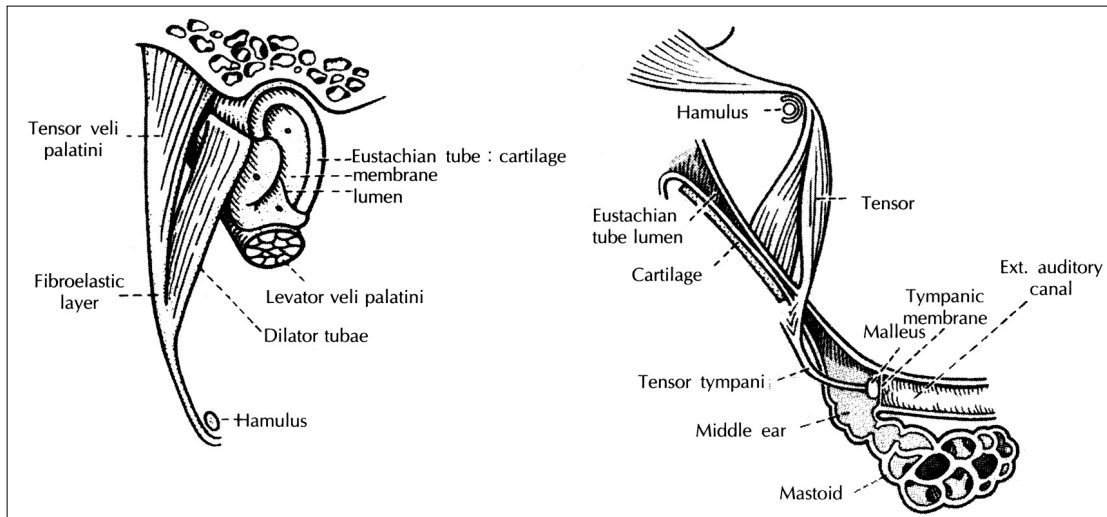


Fig. 1. E-tube and surrounding muscles.

(palatal aponeurosis)
 bundle
 1/3 가 bundle

(Levator veli palatini muscle)

가

(Salpingopharyngeus muscle)

(Tensor tympani muscle)

이관구조의 성인과 유소아의 비교

7~8

18~19

10°

가

45°

가

Ostmann's fat pad

45)

이관의 생리

(Fig. 2).

방어 작용(Protective function)

가
 가

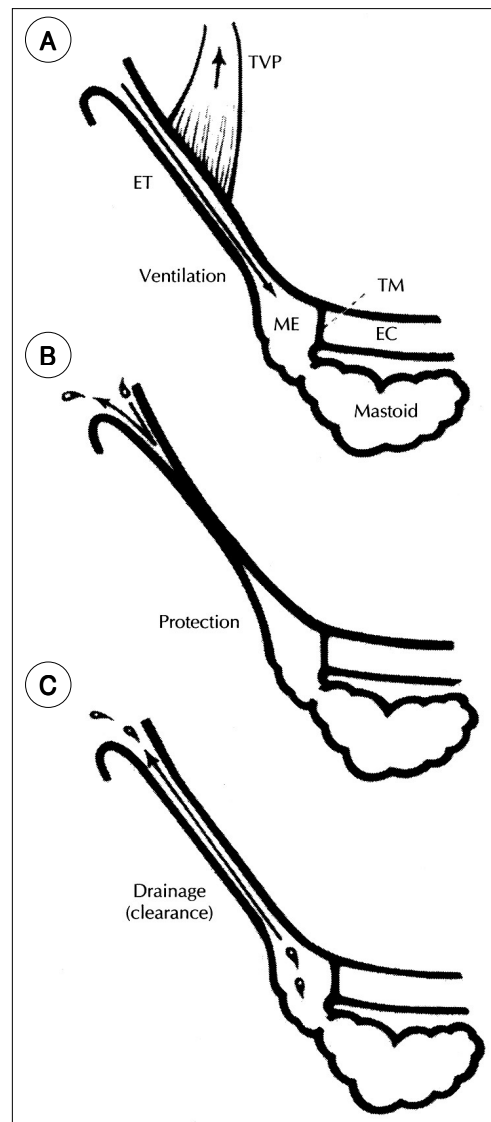


Fig. 2. Main functions of the tube.

가 . 가

가 . 가¹¹⁾¹³⁻¹⁵⁾

가

가⁶⁾ . 가 20~40 mmHg

Valsalva 20~40 mmHg 가

90 mmHg “lock”가

배출 및 정화작용(Drainage and filtering function) 가 가 “critical pressure difference”

Surfactant (surfactant)

(Mucous blanket) 가

(periciliary fluid) 가⁶⁾

layer) 가

95% (gel) 가 가

(sol) 54 mmHg 가 가

50 - 50 mmH₂O - 100 mmH₂O

가 reserve tank

nk . Bluestone flask model

(Fig. 3).¹⁰⁾¹²⁾

(Ciliary activity) 가

가 metachronism

환기 작용(Ventilatory function) 가

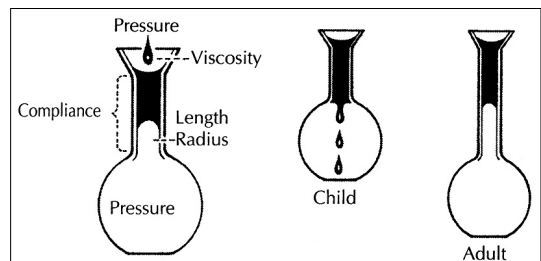


Fig. 3. Flask model of the tube with the comparison between adult and child.

가 compliance
(Fig. 3).

이관의 기능검사

가 가

기본적인 검사
1960

Valsalva, Toynbee test,
Politz method catheterization

Clearance test

charin, 0.4% indigo carmine

15

전기 자극방법

가

방사선학적 검사

Contrast medium(iodamide)

9)

고막운동성 계측(Tympanometry)

Inflation - deflation method

10)12)

indirect method

(+200 mmH₂O)

(- 200 mmH₂O)

1)

가

2)

(+200H₂O) 가

3

, di -

rect method

3)

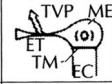
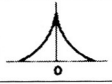
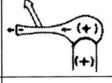

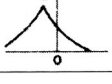
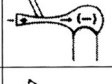
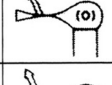
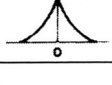
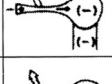

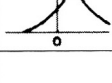

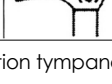
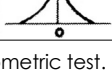
9-STEP TYMPANOMETRIC INFLATION-DEFLATION EUSTACHIAN TUBE FUNCTION TEST			
STEP	ACTIVITY	MODEL	TYMpanogram
1	RESTING PRESSURE		
2	INFLATION AND SWALLOW (x 3)		
3	PRESSURE AFTER EQUILIBRATION		
4	SWALLOW (x 3)		
5	PRESSURE AFTER EQUILIBRATION		
6	DEFLATION AND SWALLOW (x 3)		
7	PRESSURE AFTER EQUILIBRATION		
8	SWALLOW (x 3)		
9	PRESSURE AFTER EQUILIBRATION		

Fig. 4. Nine-step inflation-deflation tympanometric test.

Nine - step inflation - deflation test (Fig. 4)

Bluestone(1975) 9 - step

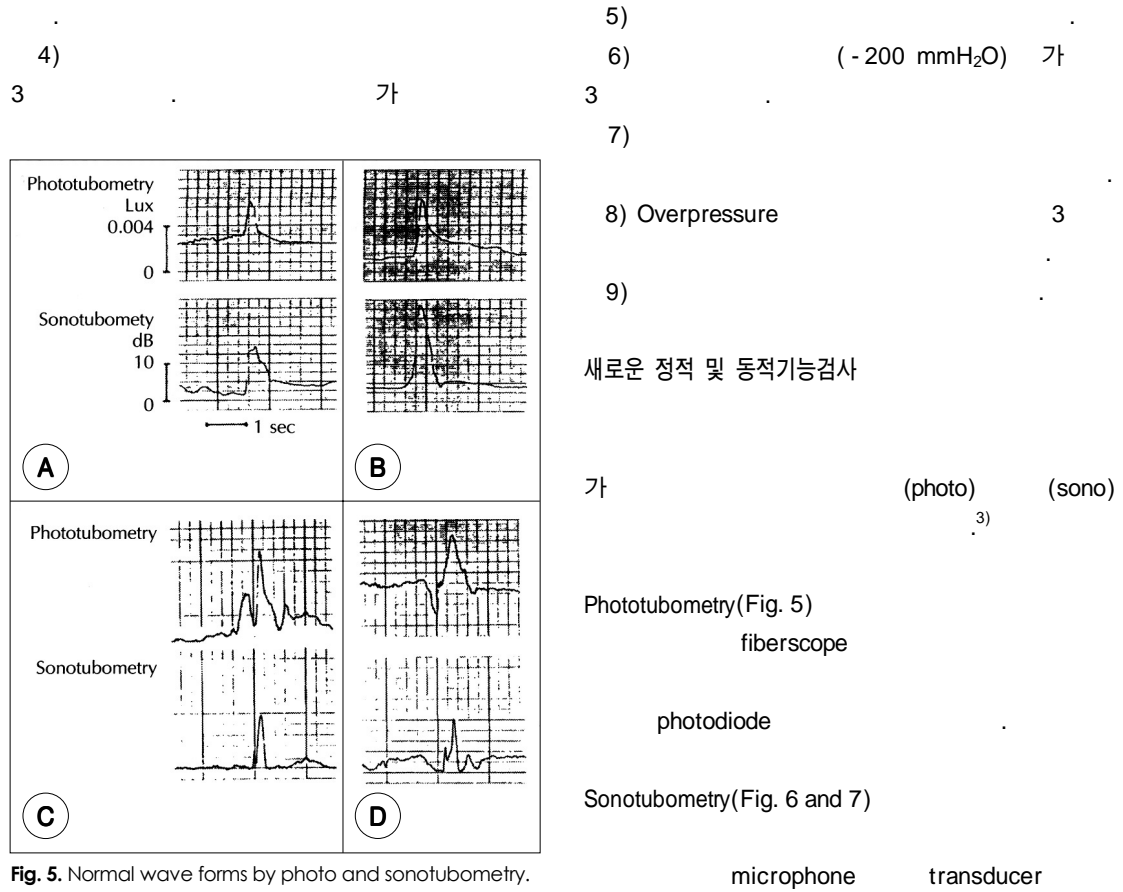


Fig. 5. Normal wave forms by photo and sonotubometry.

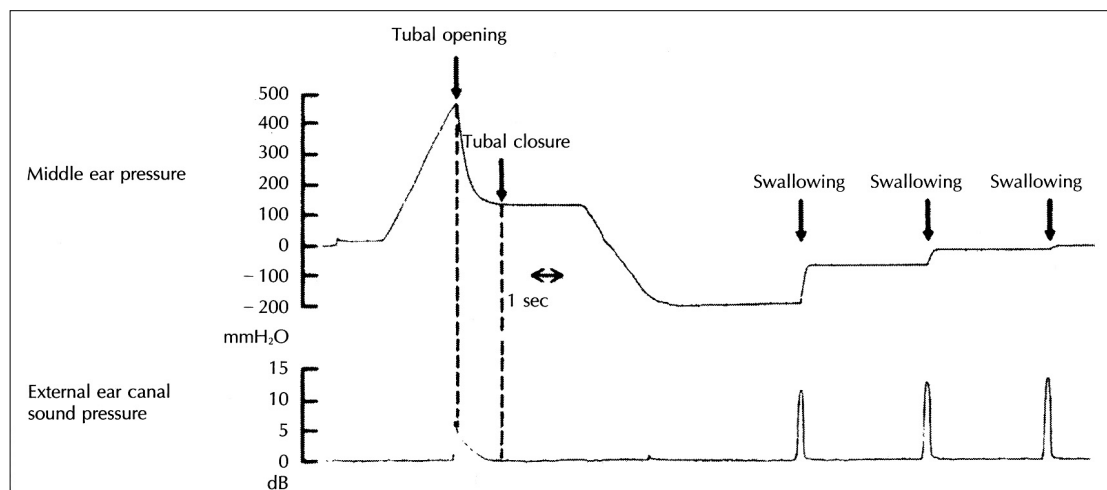


Fig. 6. Normal wave forms in dynamic conditions by sonotubometry.

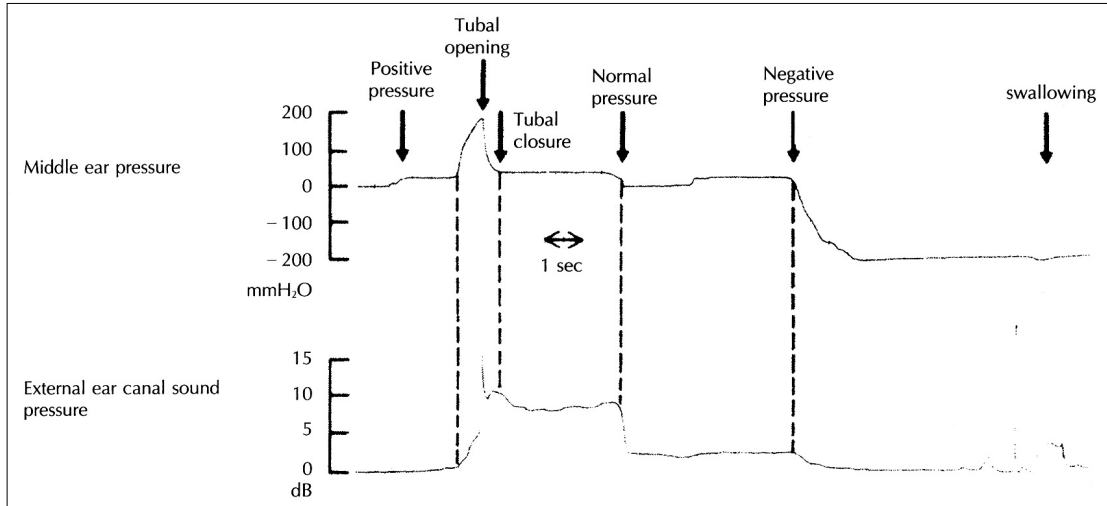


Fig. 7. Wave forms in a patient with closing failure of tube.

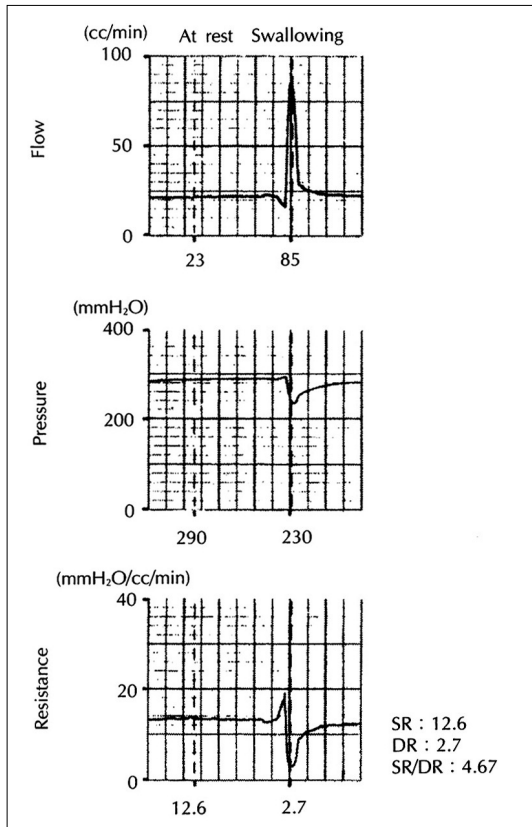


Fig. 8. A tubal resistance test with calculating force for opening tube during swallowing.

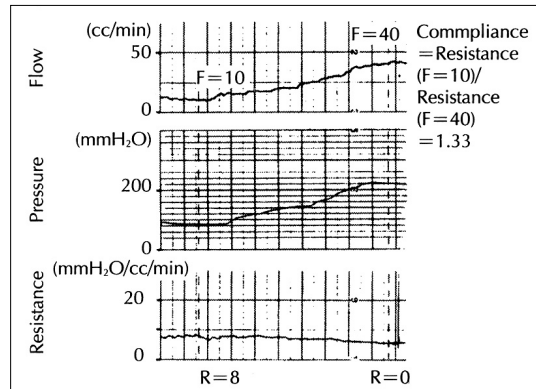


Fig. 9. Measure of compliance by changing flow rate through tube.

Flowmetry(Tubal resistance and compliance test)

가 가 Ca -
ntekin(1977)
가 compliance

(Fig. 8).

(20~25 cc/min)
 (SR)
 (DR) SR/DR
 1 .
 cc/min 10 cc/min 40
 가 compliance (Fig.
 9). compliance 10 cc /40 cc
 1.80(± 0.47)
 (Honjo et al).

REFERENCES

1) 윤용주. 이관의 해부 및 생리. 이비인후과연수강좌; 1999. p.1-13.
 2) Proctor B. *Anatomy of the eustachian tube.* Arch Otolaryngol 1973;97:2-8.
 3) Honjo I. *Function of Eustachian tube and evaluation of static and dynamic functions of eustachian tube.* In *Eustachian tube and middle ear diseases.* p.11-38, Tokyo: Springer-Verlag;1988.
 4) Bluestone C, Berry Q, Cantekin E., et al. *Eustachian tube ventilatory function in relation to cleft palate.* Ann Otol Rhinol Laryngol 1975;84:333-9.
 5) Bylander A, Ivarsson A, Tjernstrom O. *Eustachian tube*

function in normal children and adults. Acta Otolaryngol (Stockh) 1981;92:481-91.
 6) Sade J. *Ciliary activity and middle ear clearance.* Arch Otolaryngol 1967;86:128-35.
 7) Siegel MI, Todhunter JS, Doyle WJ, Rood SR. *Computer reconstruction of eustachian tube anatomy.* Ann Otol Rhinol Laryngol 1983;92 (Suppl 107):10.
 8) Aschan G. *The anatomy of the Eustachian tube with regard to its function.* Acta Soc Med Upsal 1955;60:131-49.
 9) Honjo I, Ushiro K, Okazaki N, Kumazawa T. *Evaluation of Eustachian tube function by contrast roentgenography.* Arch Otolaryngol 1981;107:350-2
 10) Bluestone CD, Cantekin EI. *Panel on experiences with testing Eustachian tube function. Current clinical methods, indications and interpretation of Eustachian tube function tests.* Ann Otol Rhinol Laryngol 1981;90:552-62.
 11) Bylander A. *Comparison of Eustachian tube function in children and adults with normal ear.* Ann Otol Rhinol Laryngol 1980;89 (Suppl 68):20-4.
 12) Cantekin EI, Bluestone CD, Saez CA, Doyle WJ, Philips DC. *Normal and abnormal middle ear ventilation.* Ann Otol Rhinol Laryngol 1977;86 (Suppl 41):1-15.
 13) Miller GF. *Eustachian tubal function in normal and diseased ears.* Arch Otolaryngol 1965;81:41-8.
 14) Perlman HB. *The eustachian tube. Abnormal patency and normal physiologic state.* Arch Otolaryngol 1939;30:212-38.
 15) Yuasa R, Takakura M. *Analysis of physical properties of the Eustachian tube.* J Otolaryngol Jpn 1971 (in Japanese); 74:749-54.