

폐쇄성 수면무호흡증의 수술적 치료

김성완·은영규

Surgical Therapy for Obstructive Sleep Apnea

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CPAP (continuous positive airway pressure, CPAP) 가 2% CPAP CPAP, CPAP 98% 1-3) 가 Mueller maneuver 4) apnea level test sensor

수술의 계획

Stanford Powell Riley 'Powell - Riley - Stanford protocol', phase I phase II 가 (Fig. 1).⁵⁾ phase I

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4~6 가 phase II

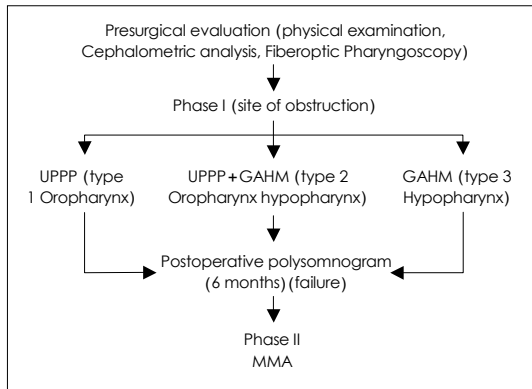


Fig. 1. The Stanford protocol of phased surgery. UPPP : Uvulopalatopharyngoplasty, MMA : Maxillomandibular advancement, GAHM : Genioglossus advancement/hyoid myotomy.

비수술(Nasal Surgery)

(Sleep -disordered breath-

ing)

가

가

nasal CPAP

(maxillomandibular advancement)

phase I

phase II

Phase I 61%, phase II 95%

¹³⁾

23

가 50

가

40

8 (35%)

가 50%

기관절개술(Tracheostomy)

¹⁴⁾

Pickwickian syndrome

⁶⁾ 가

가

가

(uvulopalatopharyngoplasty,

UPPP) 180

pressure)

(automatic positive airway

97%

가 ¹⁵⁾

가

Mickelson 347

UPPP

2%

14%

¹⁶⁾

⁷⁾⁸⁾

obesity

hyperventilation syndrome 가

⁹⁾¹⁰⁾

가
 가
 nasal CPAP
 가
 Nasal CPAP
 가
 CPAP
 Friedman¹⁷⁾

가 50
 CPAP¹³⁾
구인두 수술(Oropharyngeal Surgery)

구개수구개인두성형술(UPPP)
 UPPP 1981 Fujita 25
 가
 UPPP¹⁸⁾

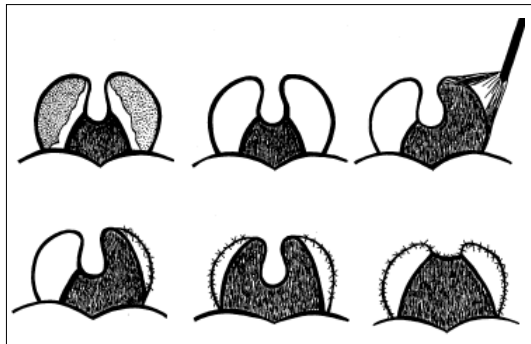


Fig. 2. Technique of uvulopalatopharyngoplasty. Sur- followed by bottom row. Tonsils are removed. Posterior tonsillar pillars are divided vertically from uvula to level of upper pole of tonsillar fossae, rotated across the fossae, and sutured to trimmed anterior tonsillar pillars. Sutures may tack the posterior pillars to the midportion of the fossa. Uvula and posterior soft palate are transected at approximately the upper pole of the tonsillar fossae.

(tonsillar pillar) (trimming)

(Fig. 2).

640
 analysis 1
 (2%), (1%), (1%),
 (1%), (0.3%),
 (1%)

meta -

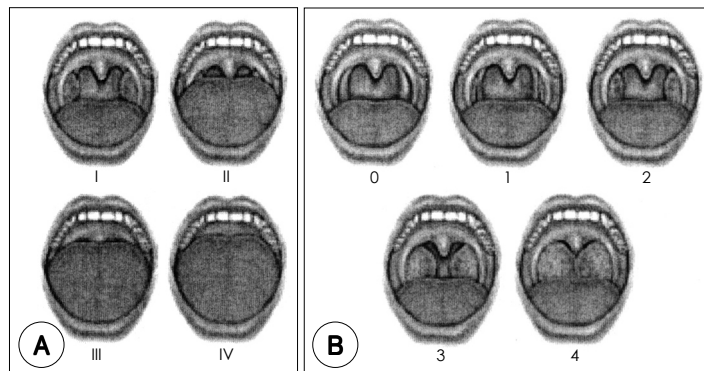


Fig. 3. Friedman classification of palatal position (A) and tonsil size (B). The Friedman palate position is based on visualization of structures in the mouth with the mouth open widely without protrusion of the tongue. Palate grade I allows the observer to visualize the entire uvula and tonsils. Palate grade II allows visualization of the uvula but not the tonsils. Grade III allows visualization of the soft palate but not the uvula. Grade IV allows visualization of the hard palate only. Tonsil size is graded from 0 to 4. Tonsil size 0 denotes surgically removed tonsils. Size 1 implies tonsils hidden within the pillars. Tonsil size 2 implies the tonsils extending to the pillars. Size 3 tonsils are beyond the pillars but not to the midline. Tonsil size 4 implies tonsils extend to the midline.

19) UPPP
 20)21) 91
 1
 31% 10% 21)
 UPPP
 meta - analysis 40.7%
 4) Friedman UPPP (Fig. 4).²³⁾ UPPP
 4
 Friedman's staging system (Fig. 3, Table 1)
 stage I 80.6%, stage II 37.9%, stage III 8.1%
 UPPP ²²⁾
 80
 UPPP
 UPPP
 측인두성형술(lateral pharyngoplasty, 이하 LPP)
 Cahali가 LPP
 가
 24)

Table 1. Friedman staging

	Friedman palate position	Tonsil size	Bmi	Success rate	
				UPPP	UPPP+TBR
Stage I	1, 2	3, 4	<40	80.60%	
Stage II	1, 2	1, 2	<40	37.90%	74.0%
	3, 4	3, 4	<40		
Stage III	3, 4	0, 1, 2	ANY	8.10%	43.8%
	ANY	ANY	>40		

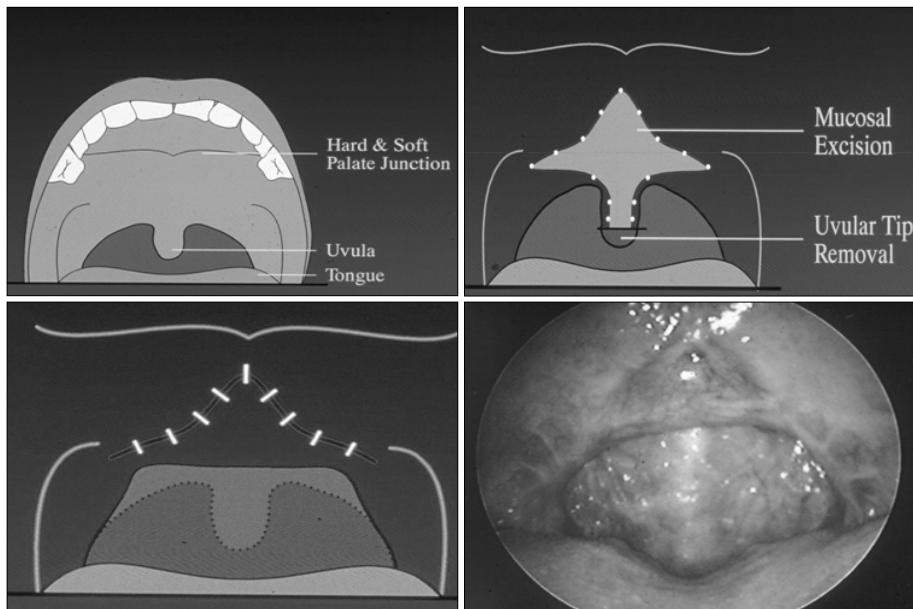


Fig. 4. The uvulopalatal flap technique. Upper left : Preoperative view, Upper Right : Palatal flap and uvular excision, Lower : Postoperative view.

가 (Fig. 6). UPPP

가 Z- (Fig. 5). Cahali 가 , UPP

10

6 - 41.2 9.5 ,

14.5

가 Z-구개성형술(Z-palatoplasty) Friedman 가

구개수구개성형술(Uvulopalatoplasty, 이하 UPP) Friedman Z- .26) UPPP

가 UPP .25)

UPPP 가 ,22)27)

UPPP UPPP 가 .28)

가

2 2.0 Vicryl 가

3.0 Chromic . Z-

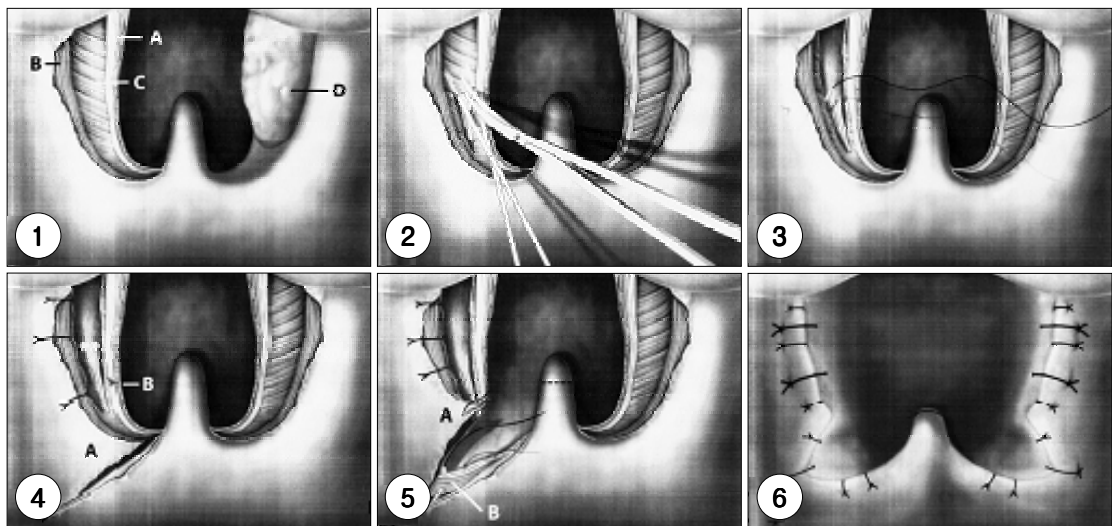


Fig. 5. The lateral pharyngoplasty technique. Operative view after left tonsillectomy. (A) palatopharyngeus muscle, (B) palatoglossus muscle, (C) superior pharyngeal constrictor muscle and (D) right tonsil. Elevation and section of the left superior pharyngeal constrictor muscle. Anterior suture of the superior pharyngeal constrictor muscle (lateral flap) to the palatoglossus muscle. (A) palatine flap, (B) section of the palatopharyngeus muscle, (***) external palatine vein (right) and ascending palatine artery (left). Z-plasty covering the superior part of the tonsillar fossa. (A) palatine flap, (B) upper part of the palatopharyngeus muscle. Incision to remove part of the uvula (dashed line). Final aspect of the lateral pharyngoplasty.

2 가 2 가 (Fig. 7).

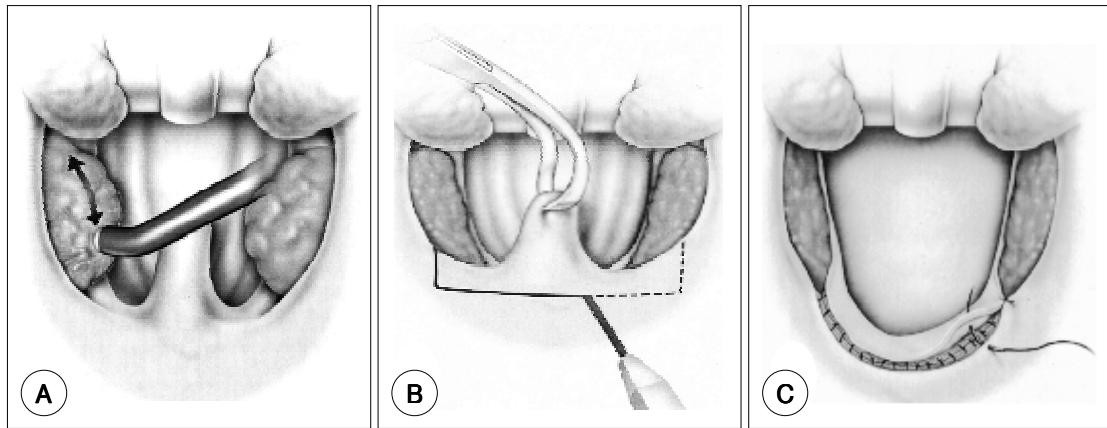


Fig. 6. The uvulopalatoplasty technique. A : Tonsillar coblation. B : The modified uvulopalatoplasty. Incision of the palatal flap after completion of tonsillar coblation. Usually, the flap is beveled, with a longer nasopharyngeal surface of the palate that is rolled over toward the oral surface of the palate to recreate the new free-edge of the palate. Standard releasing incisions at the corners of the posterior tonsillar pillars may be required to decrease mobilization of the flap. C : The modified uvulopalatoplasty. Two-layer closure of the palate.

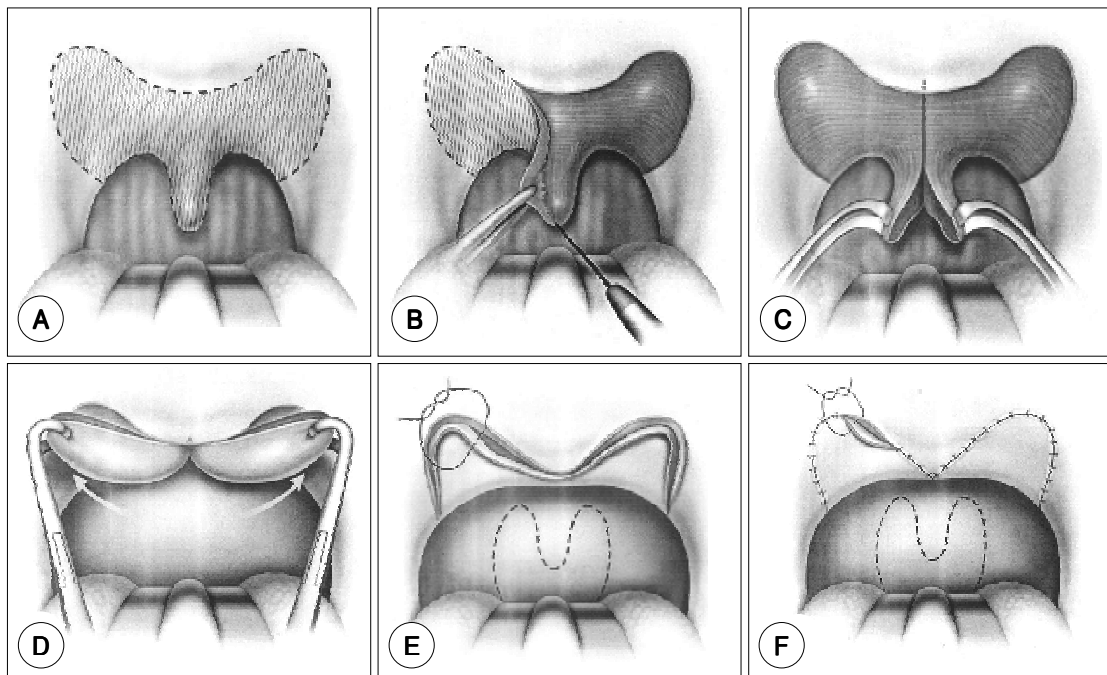


Fig. 7. The Z-platoplasty technique. A : The incision of the palatal flap is marked. B : The mucosa over the palatal flap is removed, exposing the palatal musculature. C : The uvula and palate are split in the midline with a cold knife. D : The uvular flaps along with the soft palate are reflected back laterally over the soft palate. E : Two-layered closure of the palatal flaps. The submucosal layer is approximated first with 2-0 Vicryl F : Two-layered closure of the palate.

Z - 25 UPPP

Z -

가

Z -

경구개전진 인두성형술(Transpalatal advancement pharyngoplasty)

Woodson
 .²⁹⁾ Friedman stage 3 UPPP
 8% .²²⁾

UPPP

.³⁰⁾³¹⁾

.³²⁻³⁴⁾

1 cm (Fig.

8). tensor aponeurosis

2가 가 (Fig.

9), tensor

aponeurosis가 2~3 mm

5~10 mm

UPF UPPP

. 2005 Woodson Friedman stage 3

74

UPPP

가

.²⁹⁾

하인두수술(Hypopharyngeal Surgery)

이설근전진술(Genioglossus advancement)

genial tubercle

.³⁵⁾

(cephalometry) panoramic dental X - ray

7~

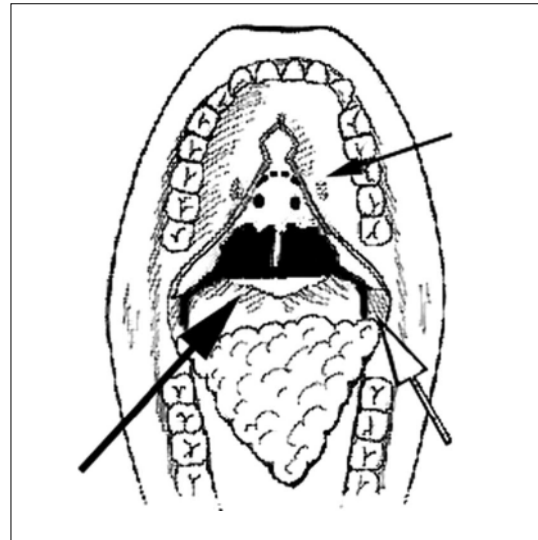


Fig. 8. Intraoral view of pharyngoplasty with palatal advancement. The palatal flap is constructed with its tip 1 cm. anterior to the level of bone removal (dotted line). The flap is medial to the greater palatine foramen (stippled area, small arrow). A vertical midline incision is extended anteriorly and this allows wider exposure. The location of the palatal drill holes are shown leaving a 5-mm margin of bone. The nasal septum is visible in the midline. The posterior osteotomized segment remains attached to the tensor tendon (large solid arrow). Laterally, the tensor tendon is incised medial to the hamulus (open arrow).

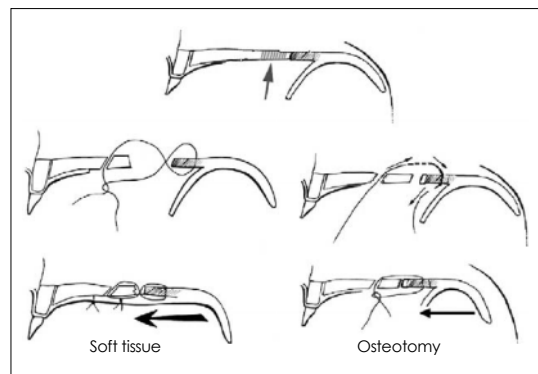


Fig. 9. Two methods of pharyngoplasty with palatal advancement. Initially, a soft-tissue technique was performed. The attachments to the soft palate to the hard palate were sharply incised, exposing the nasopharynx. Posterior hard palate bone was removed, and the soft palate was advanced (left). Subsequently, the technique was modified to perform an osteotomy. Distal palatal bone was removed (top small arrow), leaving a 2- to 3-mm bony attachment to the soft palate. Once mobilized, the bony segment and soft palate are advanced and suture tied (right).

8 mm 가 , 23% 65%
 genial tubercle 가 5 mm 가
 38-41)

10 mm

titanium screw

설근부 현수법(Tongue base suspension suture with the Repose system)

, bone wax, gelfoam ,
 60~90

DeRoew ⁴³⁾ Woodson ⁴⁴⁾
 titanium screw

(Fig. 10). UPPP
 (Hyoid advancement)

kit Repose system
 (InfluENT Inc, Herzalia, Israel)

23~77%

36-39)

proline

(Fig. 12).

가 가 20

설골 전진술(Hyoid advancement or Hyoid myotomy/
 suspension)

20%

60~80%

43-45)

가

고주파를 이용한 설근부축소술(Temperature-controlled
 radiofrequency tongue base reduction)

low wave radiofrequency(RF)

UPPP,

40)

39)41)

UPPP

42)

가

. RF (needle electrode)

(Fig. 11).

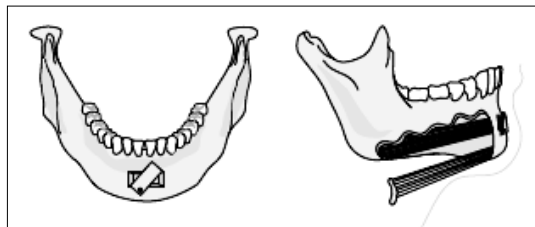


Fig. 10. The genioglossus advancement procedure. A rectangular window of symphyseal bone consisting of the geniotubercle is advanced anteriorly, rotated to allow bony overlap, and immobilized with a titanium screw. (A) Anterior view. (B) Lateral view.

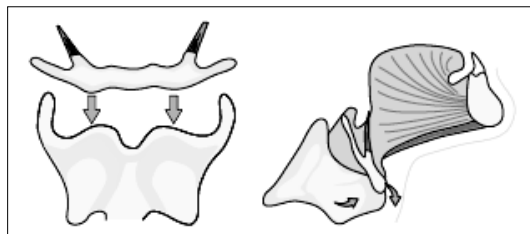


Fig. 11. The hyoid advancement procedure. The hyoid bone is isolated ; the inferior body is dissected clean ; and the majority of the suprahyoid musculature remains intact. The hyoid is advanced over the thyroid lamina and immobilized with sutures placed through the superior aspect of the thyroid cartilage.

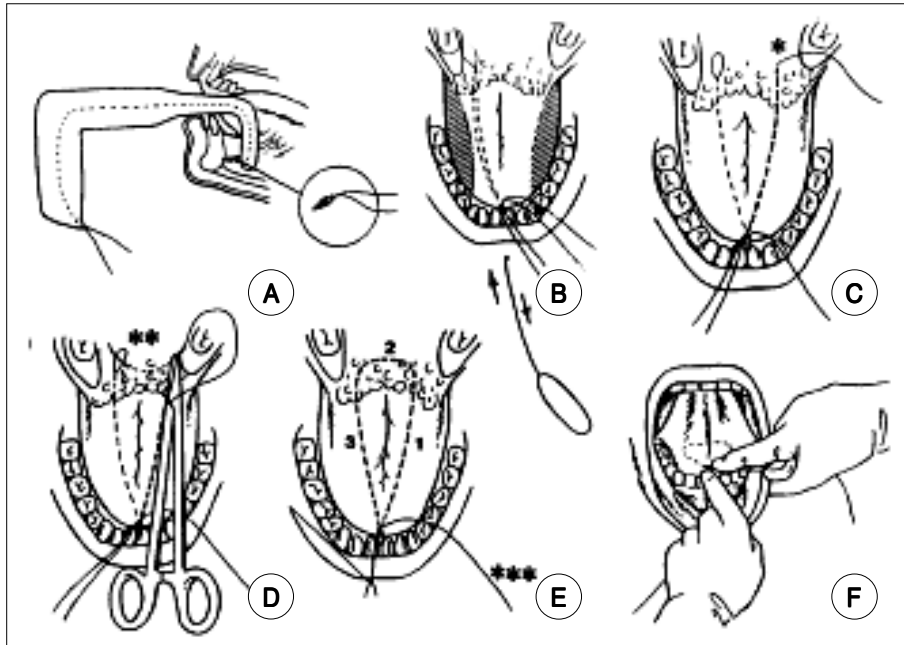


Fig. 12. Pharyngeal suspension suture with The Repose system device. A : Inserter is placed in the midline floor of the mouth posterior to the orifice of Wharton's duct. Screw is placed firmly against the mandible, with the screw perpendicular to the lingual cortex, and inserted. B : Suture passer is placed through the stab wound, and a double-looped suture is placed through the tongue lateral to the midline into the hypopharynx. The point of insertion is approximately 1 cm from the midline and 1 cm below the foramen cecum. C : A single strand of the suspension suture is then passed opposite the double loop with the suture passer (*). D : A curved Mayo needle is used to pass the suspension suture across the base of the tongue (**). E : Suspension suture is then passed into the looped strand of suture and pulled anteriorly, finishing all 3 passes. F : Suture is then tied, with care taken to avoid cutting the suture on the incisor teeth. (From Woodson BT, DeRowe A, Hawke M, et al. Pharyngeal suspension suture with Repose bone screw for obstructive sleep apnea. *Otolaryngol Head Neck Surg* 2000;122:395-401).

47) 가 18

가 55% 7

47 가 10 Li

46) (28 ± 4)

(SF - 36)

2/3 가 RF 가 48) multi - center study

1/ CPAP

가

90~100 (char) 49 - 51)

가 가 가

RF 가 가 circumvall-

ate papillae paramedian 2~4

Powell RF 1999 800/1000J (Fig. 13). 4

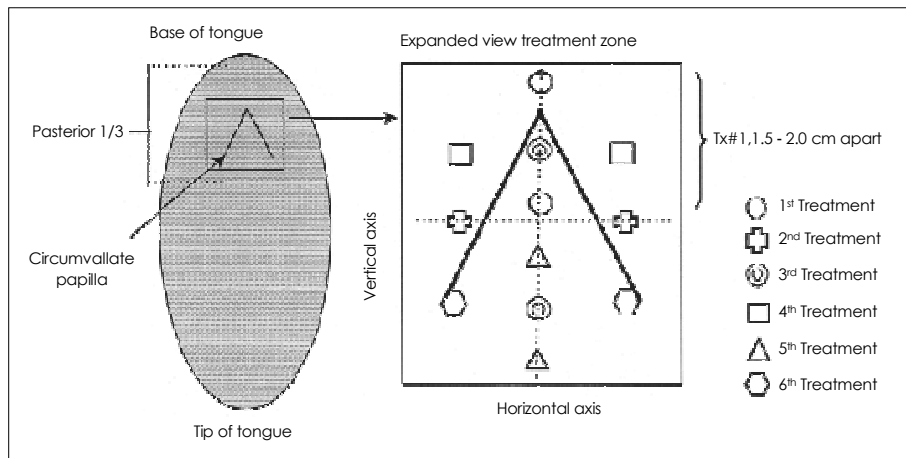


Fig. 13. Radiofrequency tissue reduction of tongue base. Treatment zone is 2.5 to 3.0 cm² and circumscribes the circumvallate papilla. Treatment distance between each lesion site is 1.5 to 2.0 cm apart. Two treatment sites are given during a session and are placed as shown. Treatment sites alternate between the vertical and horizontal axis of the tongue until the final treatment is given.

가 가

상하악 전진술(Maxillomandibular Advancement, MMA)

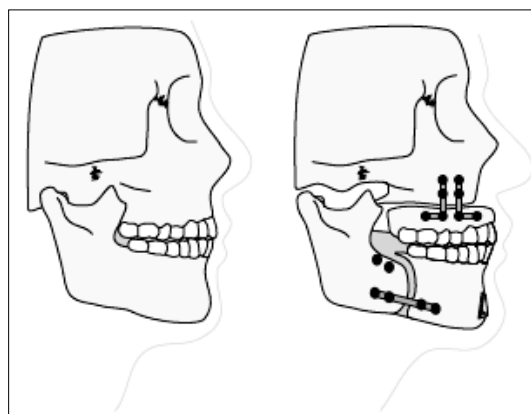


Fig. 14. The maxillomandibular advancement osteotomy procedure (lateral view). Le fort I maxillary osteotomy with rigid plate fixation and a bilateral sagittal split mandibular osteotomy with bicortical screw fixation. The advancement is at least 10 mm.

(Fig. 14). 가

18)19)

()

52) Le Fort I

10~12 mm

53)

4

가

75~

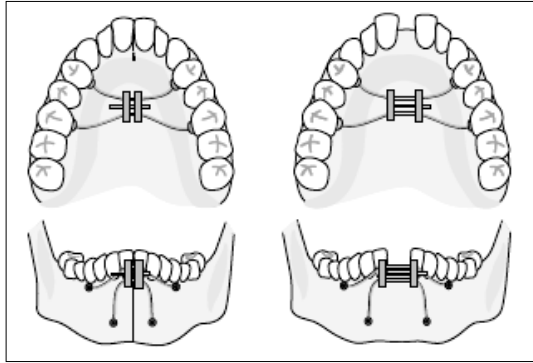


Fig. 15. The maxillomandibular expansion procedure. Upper left and right : Osteotomy is performed above the roots of the maxillary teeth and between the roots of the maxillary central incisors. The distractor at the palate allows for slow expansion of the maxilla. Lower left and right : Osteotomy is performed between the mandibular central incisor teeth. The distractor allows for slow expansion of the mandible. The distractors are usually left in place for 3 months to provide stability of the maxilla and mandible until the newly formed bone is completely ossified.

100% (37)(38)(54)(55)
90% (56)(57)

상하악 확장술(Maxillomandibular Expansion)

가 (58-60)
가 (61)
가 (62)

(Fig. 15).

가

수술 전후의 처치

가 46 cm
()가
가 (63)
24
24
2
Riley (64)(65)
(64)

(63)
가 4~6 CPAP
nasal CPAP 4~6
가 가
가 (66)(67) Rennote
nasal CPAP
(68) Powell
REM rebound
2 nasal CPAP
2 nasal CPAP
nasal CPAP 35% humidified
oxygen (63) CPAP

CPAP

가

(69)

가
 Riley CPAP
 morphine sulfate me-
 peridine HCL , mepe-
 ridine HCL , oxycodone
 63)
 가
 70)
 가
 가

중심 단어 :

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