

การผ่าตัดเย็บรอยแยกริมฝีปากและเพดานแบบขั้นตอนเดียว และสองขั้นตอนในผู้ป่วยปากแหว่งเพดานโหว่แบบสมบูรณ์ One-Stage and Two-Stage Surgical Closures of Cleft Lip and Palate: A Review

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บทคัดย่อ

รอยแยกบริเวณช่องปากและใบหน้าเป็นการเจริญบกพร่องของใบหน้าที่พบบ่อยที่สุดและทำความสำเร็จของการรักษาซึ่งต้องอาศัยการทำงานแบบเป็นทีมอันประกอบด้วยบุคลากรทั้งจากสายแพทย์และทันตแพทย์ การผ่าตัดเย็บรอยแยกจมูก ริมฝีปากและ/หรือ เพดานในผู้ป่วยปากแหว่งเพดานโหว่แบบสมบูรณ์ถือเป็นขั้นตอนพื้นฐานสำคัญของการรักษา ศัลยกรรมเบื้องต้นดังกล่าวมีหลายแนวทางที่นิยมแต่ยังขัดแย้งกันอยู่ ได้แก่ การผ่าตัดขั้นตอนเดียวโดยการเย็บปิดรอยแยกทั้งหมดพร้อมกันในการผ่าตัดครั้งเดียว และการผ่าตัดสองขั้นตอนโดยการเย็บจมูกและริมฝีปากก่อน แล้วจึงเย็บซ่อมเสริมเพดานในภายหลัง บทความนี้ได้กล่าวถึงพื้นฐานและเปรียบเทียบการรักษาทั้งสองแนวทาง

คำสำคัญ: ปากแหว่งเพดานโหว่, การผ่าตัดแบบขั้นตอนเดียว, การผ่าตัดแบบสองขั้นตอน

Abstract

Oro-facial clefts are the most common facial defects that challenge treatment success. Treatment for these particular defects needs a proper interdisciplinary approach, which includes medical and dental assessments. Primary surgical repair of nose, lip and/or palate in patients with complete clefts is the fundamental step in treatment. Protocols for the primary treatment vary; however, two approaches are generally accepted, albeit with controversy. One is the repair of all those structures in one surgical session or “one-stage closure.” The other is the separation of the operations on the nose /lip and palate, known as “two-stage closure.” The background and a comparison of those different approaches are revealed in this article.

Keywords: Oro-facial cleft, one-stage closure, two-stage closure.

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Introduction

Non-syndromic cleft is a worldwide major congenital oro-facial defect (Figure 1) with a frequency of 1:700 live births on average.⁽¹⁾ The highest rate was often reported in Asian and Amerindian populations at 2:1,000 or higher.⁽²⁾ The Caucasian population was intermediate at 1.2-1.6 per 1,000.⁽³⁾ The African population was the lowest at 0.61:1,000.⁽²⁾ Among Asians, the risk for oral cleft is higher in the Far East, e.g., Japanese, Chinese and Koreans.⁽³⁾ In Thailand, the prevalence during 1989-91 was 1.62:1,000 live births and 59% of cleft patients lived in the North-East.⁽⁴⁾ Types of cleft varied between sexes. Cleft lip and palate was usually revealed in males (1:0.76), whereas isolated cleft palate was discovered more often in females (2.88:1). Overall, clefts were exposed in males more than in females (2:1).⁽⁵⁾ Unilateral clefts were registered most often (76%) with left-sided clefts of the lip (alveolus and palate) noted in 52%, right-sided in 24%, and 24% for bilateral clefts.⁽¹⁾

There are many classifications of clefts; however, one commonly used was first described by Veau in 1931.⁽⁶⁾ This classification simply divides the defects into four subgroups (Figure 1). Class I is an incomplete cleft of the soft palate; Class II is a complete cleft of the secondary palate, including both the soft and the hard palates; Class III is a complete unilateral cleft of the lip and alveolus (primary palate); and Class IV is a complete unilateral cleft of the hard and soft palates (secondary palate).

The etiology of clefts is complex and unknown, and includes genetic and environmental factors.⁽⁷⁾ Tribulations of patients associated with cleft are feeding, speech, hearing, dental irregularities, impaired growth of the midface and psychological problems. The best treatment protocol should ensure good esthetic and functional

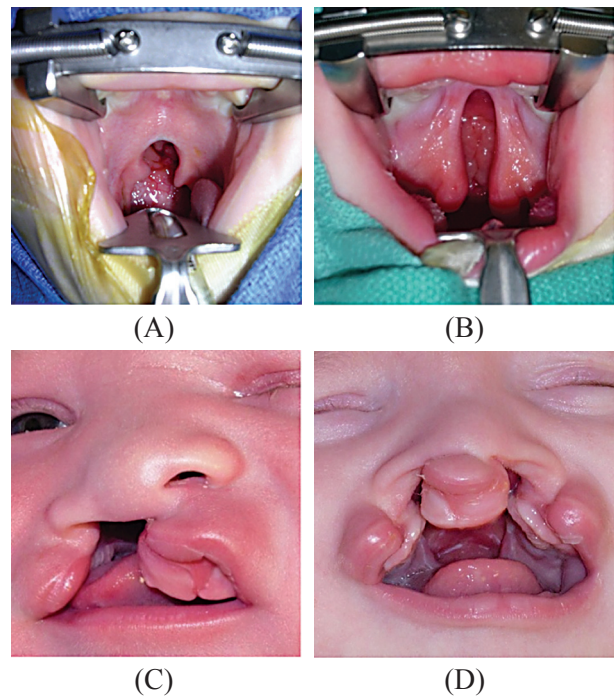


Figure 1 *Veau Classification.* Class I is a cleft of soft palate (incomplete cleft) (A). Class II is a cleft of hard and soft palate (B). Class III is a complete unilateral cleft lip and palate (C). Class IV is a complete bilateral cleft lip and palate (D).

รูปที่ 1 การจำแนกตาม Veau แบบที่ I รอยแยกเพดานอ่อน (A) แบบที่ II รอยแยกเพดานแข็งและเพดานอ่อน (B) แบบที่ III รอยแยกริมฝีปากและเพดานด้านเดียวแบบสมบูรณ์ (C) แบบที่ IV รอยแยกริมฝีปากและเพดานสองด้านแบบสมบูรณ์ (D)

outcomes when these patients are adults. The patients should be able to speak with a clear voice, to have no fluid regurgitating through the nose while eating or swallowing, to have an invisible scar, and no growth disturbance.⁽⁸⁾

In Thailand, the Orthodontic Foundation recommends the use of presurgical orthopaedic plates after birth, and before lip closure, which is carried out between three and four months of age. The palatal cleft is often repaired later, at nine to twelve months of age (Table 1). The use of the plates is claimed by many authors to mold palatal

Table 1 Guidelines for treatment in patients with cleft lip and palate

ตารางที่ 1 แนวทางการรักษาผู้ป่วยปากแหว่งเพดานโหว่

Age	Management
0-3 months	Presurgical orthopaedic plate
3 months	Repair of the cleft lip, nasal floor repair and nose
4-9 months	Oral care, speech assessment
9-12 months	Repair of palate
1-4 years	Oral care, secondary repair of lip and palate
4-5 years	VPI, secondary repair of nose
5-8 years	Orthodontic preparation for bone grafting
8-11 years	Orthodontic treatment for bone grafting
11-12 years	Definitive orthodontics
12-15 years	Orthodontic treatment with temporary prosthesis
>15 years	Orthognathic surgery, corrective dentistry

Table 2 Comparison of timing of one-stage and two-stage closures

ตารางที่ 2 เปรียบเทียบจังหวะเวลาในการผ่าตัดเย็บรอยแยกริมฝีปากและเพดานระหว่างการผ่าตัดแบบขั้นตอนเดียวและสองขั้นตอน

Procedure	Lip (age in months)	Palate (age in months)	
		Hard	Soft
One-stage		6-18	
Two-stage *Early (one-stage) hard palate closure	3	6-18	6-18
*Delayed (two-stage) hard palate closure	3	96-132	9-18

segments into a more or less normal arch form, leading to fewer difficulties in feeding and in surgical repair. Unfortunately, none of these claims have been substantiated by long term studies.⁽⁹⁾

Surgical repairs in patients with cleft lip and

palate, especially during the first year of life, are fundamental steps in the whole treatment process. There are two major protocols of lip and palate closure, one-stage closure and two-stage closure (Table 2). All soft tissue cleft structures are repaired in one surgical session for the one-stage approach, whereas the two-stage approach is separated into two procedures: lip repair and then palate repair.

One-stage closure of cleft lip and palate

One-stage closure, or “simultaneous repair,” is based on repair within the first year. It is infrequently performed in cleft centers worldwide, despite more than 40 years having passed since it was introduced by Davies in 1966.⁽¹⁰⁾ The concept of “one-stage closure,” or “simultaneous repair,” involves early repair of the entire cleft within the first 12 months, preferably between six and 12 months, of life. According to this concept, cleft lip, palate and alveolus are repaired in one surgical session to obtain the best functional and developmental results.

Two-stage closure of cleft lip and palate

In two-stage closure, the lip and palate repairs are performed separately. The lip repair is managed at a mean age of three months before the palate repair. Dorf and Curtin⁽¹¹⁾ divided the two-stage repair into two subgroups determined by the timing of palate repair: early and late palatal closure. Twelve months of age was used as an arbitrary dividing point between early and late palatal closure.

Early palatal closure is simultaneous or separate repair of hard and soft palate at the mean age of three to 12 months when patients start to learn to speak. An apparent advantage of early

palatal closure is that it avoids disturbances of normal development of speech in early life,⁽¹²⁾ produces less oronasal fistulization, less velopharyngeal incompetence, and less need for secondary operations for speech.⁽¹³⁾ Nevertheless, a criticism of this approach is the possibility of causing substantial disturbances in maxillary growth.

In 1968, Schweckendiek⁽¹⁴⁾ advocated a two-stage palate repair with early closure of the soft palate. The hard palate was left open with the rationale that this would allow normal development of the maxilla. The oronasal fistula was occluded by prostheses until the hard palate was closed at 15 years of age. This procedure offers soft palate closure for speech but delayed hard palate closure to avoid early subperiosteal dissection and reduce scar of palate.⁽¹⁵⁾ In theory, late hard palate repair should be less damaging than early hard palate repair because of the effects of scar tissue on maxillary growth. Friede and Enemark⁽¹⁶⁾ found that patients who had hard palate repair at 104 months had less retrusion of the maxilla and better jaw relation than did patients who had such repair at three months. The fundamental advantage of this technique is to avoid scarring of the hard palate which affects growth of the maxilla, but disadvantages are problems of articulation.⁽¹⁷⁾

One-stage closure and two-stage closure of cleft lip and palate

The comparison of the outcomes between one-stage and two-stage closure of cleft lip and palate are still controversial. Some studies have revealed a growth aberration.⁽¹⁸⁻²¹⁾ Simultaneous closure in rabbits resulted in inhibition of anterior-posterior and transverse maxillary growth.⁽¹⁸⁾ Some significant changes were also found in mandibular length and nasal deflection. All subjects developed

anterior crossbite and functional shifts to the cleft side. Simultaneous lip and palate repair resulted in more severe craniofacial and maxillary growth aberrations than did lip repair or palate repair performed separately.⁽¹⁹⁻²¹⁾ It is noteworthy that these studies were experimental and their results cannot be adapted to the clinical setting. However, many of these studies⁽²²⁻²⁵⁾ demonstrated that simultaneous repair of cleft lip and palate before 12 months of age provided better speech, hearing results, and maxillofacial growth. Deng et al.⁽²²⁾ stated that simultaneous repair of lip and palate in infancy is safe and reliable. Acceptable or excellent lip appearance and speech function was obtained in this operation. In 1996, Honigmann⁽²⁶⁾ published a preliminary report on one-stage closure in patients with clefts during the first year of life. One-stage repair includes the anatomical reconstruction of the soft palate, hard palate closure in two layers, alveoloplasty with bone grafting and lip repair. He observed that growth problems have not been seen in the primary dentition period. Although Fudalej, et al.⁽²⁷⁾ reported that retruded maxilla and mandible were presented as decreased SNA and SNB angles (Figure 2), the maxilla rotated

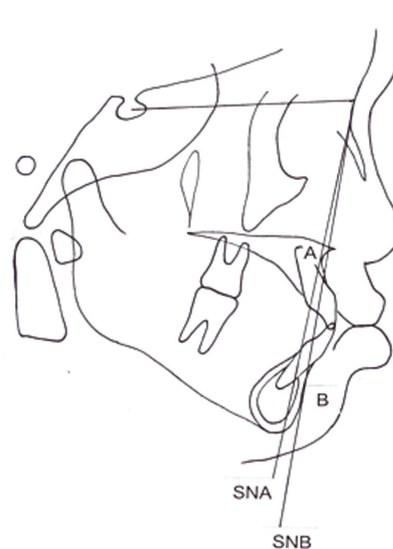


Figure 2 SNA and SNB angles

รูปที่ 2 มุม SNA และ SNB

anteriorly while the mandible rotated posteriorly. The craniofacial structures, as seen on postero-anterior cephalograms, of subjects following a one-stage simultaneous repair are symmetrical. Corbo, et al.⁽²⁸⁾ and Savaci, et al.⁽²⁹⁾ compared cephalograms of patients who underwent either simultaneous repair or two-stage operation with those of patients without clefts. Although the groups with clefts revealed retruded maxilla and mandible with backward rotation of the palatal plane, no significant differences were observed between them. De Mey, et al.⁽³⁰⁾ reported that the anterior midfacial morphology of patients with clefts at 10 years of age was not different after one-stage and two-stage palatal closure. One-stage closure resulted in less downward inclination of the maxillary plane to the anterior cranial base than did two-stage closure. Several other studies also shared personal opinions and details supporting this surgical protocol.^(24,25) Nevertheless, long-term follow-up, especially regarding craniofacial growth, is still limited.

Timing of hard palate closure

The optimal time for hard palate closure in patients with cleft lip and palate remains controversial. The controversy is focused on early palatoplasty to improve speech development versus delayed palatal closure to minimize disturbance of facial growth.⁽³¹⁻³⁴⁾ Friede and Enemark⁽¹⁶⁾ indicated that delayed hard palate closure resulted in more growth, possibly because interference with maxillary growth was postponed to a later age, when less growth remained. Liao, et al.⁽³⁵⁾ reported that late hard palate repair has a smaller adverse effect on the growth of maxilla than does early hard palate repair. This timing primarily affects the anteroposterior development of the maxillary dentoalveolus and is attributed to the development being undisturbed before closure

of the hard palate. A comprehensive review by Rohrich et al. recommends a two-stage palate repair, with soft palate repair at three to six months of age and hard palate repair at 15 to 18 months of age.⁽³¹⁾ The investigators previously referenced in this paragraph advocated delayed hard palate closure. Friede et al.⁽³⁶⁾ still questioned whether it is necessary to delay repair until the age of nine years rather than five years, because similar and satisfactory maxillary growth was found in two samples in which patients underwent surgery at different ages. Ross⁽³⁷⁾ concluded that variation in the timing and technique of hard palate repair within the first decade of life did not affect growth appreciably. He also emphasized the importance of palatal closure for psychological reasons and speech development. Noverraz, et al.⁽³²⁾ suggested that early hard palate closure results in no significant differences in dental arch relationships in the four stages of dental development; deciduous dentition, early mixed dentition, late mixed dentition and permanent dentition.

The majority of practitioners, however, repair both hard and soft palates simultaneously between nine and 12 months of age, finding a compromise between the benefits of early repair for speech outcomes and delayed repair for growth outcomes.

In relation to the effects of maxillary growth after lip repair, lip repair is the most important factor in the restraint of maxillary growth in patients with complete unilateral clefts of lip, alveolus and palate. The height and projection of the upper lip are reduced following lip repair.⁽³⁸⁾ Shi et al.⁽³⁹⁾ reported that lip repair (Millard-rotation-advancement technique) had inhibitory effects on anteroposterior growth of the maxilla. The nasal septum deviated to the cleft side. da Silva Filho et al. reported that the effect after lip repair consisted of reduction of the premaxillary anterior projection and lingual tipping of the upper

incisors.⁽⁴⁰⁾ However, comparative studies concerning different methods of lip repair in patients with unilateral cleft have shown no differences in maxillary growth.⁽³⁷⁾

Patients with an isolated cleft palate, which is related to the inherent growth limitation of the congenital anomaly, may have midfacial hypoplasia.⁽⁴¹⁾ The growth disturbance is more pronounced in patients with clefts of both the primary and secondary palates (lip and palate) than with of the secondary palate alone. Palate repair inhibits forward displacement of the basal maxilla and anteroposterior development of the maxillary dentoalveolus. Palate repair has no effects on the growth of the mandible.⁽⁴²⁾

Discussion

Many authors have reported the reduction in growth of the midface and maxilla after closure of alveolar clefts and have described disturbance in midface growth as a consequence of cleft lip closure.⁽⁴³⁾ Closure of the lip or alveolus and palate was affected to facial growth including maxillary arch dimensions. The optimal timing of the hard palate repair is still controversial. The type of surgery that can achieve optimal development of both speech and maxillary growth has been questioned.

Simultaneous repair of cleft lip and palate is an old procedure that has been the subject of debate during the past four decades. Reasons for the one-stage closure are financial and psychological.⁽¹⁹⁾ First, the one-stage repair is less expensive than repeated operative procedures. A short hospitalization period saves the children from the high risk of infections. Furthermore, the psychological stress connected with a hospitalization can be reduced if it occurs before the age when the baby is aware of himself or herself. The dissection of an unscarred operating area is a

significant advantage for undisturbed primary wound healing with a low rate of palatal fistula formation.⁽²⁴⁾ Unfortunately, most studies of this procedure did not reveal comprehensive results or sufficient follow-up time.

It is also difficult to control confounding factors such as different surgeons and different treatment schedules. The experience and skills of the surgeon in tissue management may have more influence on craniofacial development than the technique or timing of hard palate closure.⁽⁴⁴⁾ The limitation of these studies, the reported outcome, are variable depending on the age of the patients at examination, the size of groups of patients and different severity of disease.⁽³⁷⁾

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References

1. Gundlach KK, Maus C. Epidemiological studies on the frequency of clefts in Europe and world-wide. *J Craniomaxillofac Surg* 2006; 34 Suppl 2: 1-2.
2. Croen LA, Shaw GM, Wasserman CR, Tolarova MM. Racial and ethnic variations in the prevalence of orofacial clefts in California, 1983-1992. *Am J Med Genet* 1998;79:42-47.
3. Shah CP, Wong D. Management of children with cleft lip and palate. *Can Med Assoc J* 1980; 122: 19-24.

4. Chuangsuwanich A, Aojanepong C, Muangsombut S, Tongpiew P. Epidemiology of cleft lip and palate in Thailand. *Ann Plast Surg* 1998; 41: 7-10.
5. Zhou QJ, Shi B, Shi ZD, Zheng Q, Wang Y. Survey of the patients with cleft lip and palate in China who were funded for surgery by the Smile Train Program from 2000 to 2002. *Chin Med J* 2006; 119: 1695-1700.
6. van Aalst JA, Kolappa KK, Sadove M. MOC-PSSM CME article: Nonsyndromic cleft palate. *Plast Reconstr Surg* 2008; 121: 1-14.
7. Schutte BC, Murray JC. The many faces and factors of orofacial clefts. *Hum Mol Genet* 1999; 8: 1853-1859.
8. Molsted K. Treatment outcome in cleft lip and palate: issues and perspectives. *Crit Rev Oral Biol Med* 1999; 10: 225-239.
9. Grayson BH, Cutting CB. Presurgical nasoalveolar orthopedic molding in primary correction of the nose, lip, and alveolus of infants born with unilateral and bilateral clefts. *Cleft Palate Craniofac J* 2001; 38: 193-198.
10. Davies D. The one-stage repair of unilateral cleft lip and palate: a preliminary report. *Plast Reconstr Surg* 1966; 38: 129-136.
11. Dorf DS, Curtin JW. Early cleft palate repair and speech outcome. *Plast Reconstr Surg* 1982; 70: 74-81.
12. Nguyen PN, Sullivan PK. Issues and controversies in the management of cleft palate. *Clin Plast Surg* 1993; 20: 671-682.
13. Holland S, Gabbay JS, Heller JB, O'Hara C, Hurwitz D, Ford MD et al. Delayed closure of the hard palate leads to speech problems and deleterious maxillary growth. *Plast Reconstr Surg* 2007; 119: 1302-1310.
14. Schweckendiek W. Early veloplasty and its results. *Acta Otorhinolaryngol Belg* 1968; 22: 697-703.
15. Schweckendiek W, Doz P. Primary veloplasty: long-term results without maxillary deformity. a twenty-five year report. *Cleft Palate J* 1978; 15: 268-274.
16. Friede H, Enemark H. Long-term evidence for favorable midfacial growth after delayed hard palate repair in UCLP patients. *Cleft Palate Craniofac J* 2001; 38: 323-329.
17. Lilja J, Mars M, Elander A, Enocson L, Hagberg C, Worrell E et al. Analysis of dental arch relationships in Swedish unilateral cleft lip and palate subjects: 20-year longitudinal consecutive series treated with delayed hard palate closure. *Cleft Palate Craniofac J* 2006; 43: 606-611.
18. Bardach J, Roberts DM, Yale R, Rosewall D, Mooney M. The influence of simultaneous cleft lip and palate repair on facial growth in rabbits. *Cleft Palate J* 1980; 17: 309-318.
19. Bardach J, Kelly KM, Jakobsen JR. Simultaneous cleft lip and palate repair: an experimental study in beagles. *Plast Reconstr Surg* 1988; 82: 31-41.
20. Bardach J, Kelly KM, Salyer KE. A comparative study of facial growth following lip and palate repair performed in sequence and simultaneously: an experimental study in beagles. *Plast Reconstr Surg* 1993; 91: 1008-1016.
21. Bardach J, Kelly KM, Salyer KE. Relationship between the sequence of lip and palate repair and maxillary growth: an experimental study in beagles. *Plast Reconstr Surg* 1994; 93: 269-278.
22. Deng X, Cheng N, Wang H, Zhai J, Cui Y, Deng H et al. Simultaneous repair of complete cleft lip and palate in infancy-preliminary observation (271 cases report). *Zhonghua Zheng Xing Wai Ke Za Zhi* 2002; 18: 211-213.

23. Kaplan I, Dresner J, Gorodischer C, Radin L. The simultaneous repair of cleft lip and palate in early infancy. *Br J Plast Surg* 1974; 27: 134-138.
24. Lejour M. The effects of simultaneous cleft lip and palate repair on craniofacial growth. *Plast Reconstr Surg* 1989; 83: 751-752.
25. Alkhairy F. Effect on craniofacial growth of simultaneous cleft lip and palate repair. *Plast Reconstr Surg* 1993; 92: 379-380.
26. Honigsmann K. One-stage closure of uni- and bilateral cleft lip and palate. *Br J Oral Maxillofac Surg* 1996; 34: 214-219.
27. Fudalej P, Krol Z, Dudkiewicz Z. Cephalometric evaluation of craniofacial symmetry in the complete unilateral cleft lip and palate patients following a one-stage simultaneous repair. *Med Wieku Rozwoj* 2007; 11: 255-259.
28. Corbo M, Dujardin T, de Maertelaer V, Malevez C, Glineur R. Dentocraniofacial morphology of 21 patients with unilateral cleft lip and palate: a cephalometric study. *Cleft Palate Craniofac J* 2005; 42: 618-624.
29. Savaci N, Hosnuter M, Tosun Z, Demir A. Maxillofacial morphology in children with complete unilateral cleft lip and palate treated by one-stage simultaneous repair. *Plast Reconstr Surg* 2005; 115: 1509-1517.
30. De Mey A, Swennen G, Malevez C, George M, Mansbach AL. Long-term follow-up of UCLP at the Reine Fabiola Children's Hospital. *B-ENT* 2006; 2 Suppl 4: 44-50.
31. Rohrich RJ, Love EJ, Byrd HS, Johns DF. Optimal timing of cleft palate closure. *Plast Reconstr Surg* 2000; 106: 413-421.
32. Noverraz AE, Kuijpers-Jagtman AM, Mars M, van't Hof MA. Timing of hard palate closure and dental arch relationships in unilateral cleft lip and palate patients: a mixed-longitudinal study. *Cleft Palate Craniofac J* 1993; 30: 391-396.
33. Semb G. A study of facial growth in patients with unilateral cleft lip and palate treated by the Oslo CLP Team. *Cleft Palate Craniofac J* 1991; 28: 1-21.
34. Friede H, Lilja J, Johanson B. Cleft lip and palate treatment with delayed closure of the hard palate. A preliminary report. *Scand J Plast Reconstr Surg* 1980; 14: 49-53.
35. Liao YF, Mars M. Hard palate repair timing and facial morphology in unilateral cleft lip and palate: Before versus after pubertal peak velocity age. *Cleft Palate Craniofac J* 2006; 43: 259-265.
36. Friede H, Priede D, Moller M, Maulina I, Lilja J, Barkane B. Comparisons of facial growth in patients with unilateral cleft lip and palate treated by different regimens for two-stage palatal repair. *Scand J Plast Reconstr Surg Hand Surg* 1999; 33: 73-81.
37. Ross RB. Treatment variables affecting facial growth in complete unilateral cleft lip and palate. *Cleft Palate J* 1987; 24: 5-77.
38. Li Y, Shi B, Song QG, Zuo H, Zheng Q. Effects of lip repair on maxillary growth and facial soft tissue development in patients with a complete unilateral cleft of lip, alveolus and palate. *J Craniomaxillofac Surg* 2006; 34: 355-361.
39. Shi B, Long J, Wang Q. The influence of Millard-lip-repair on maxillary growth: an experiment study in rabbits. *Hua Xi Kou Qiang Yi Xue Za Zhi* 1999; 17: 102-104, 107.
40. da Silva Filho OG, Valladares Neto J, Capelloza Filho L, de Souza Freitas JA. Influence of lip repair on craniofacial morphology of patients with complete bilateral cleft lip and palate. *Cleft Palate Craniofac J* 2003; 40: 144-153.
41. Shibasaki Y, Ross RB. Facial growth in children with isolated cleft palate. *Cleft Palate J* 1969; 6: 290-302.

42. Liao YF, Mars M. Long-term effects of clefts on craniofacial morphology in patients with unilateral cleft lip and palate. *Cleft Palate Craniofac J* 2005; 42: 601-609.
43. Han BJ, Suzuki A, Tashiro H. Longitudinal study of craniofacial growth in subjects with cleft lip and palate: from cheiloplasty to 8 years of age. *Cleft Palate Craniofac J* 1995; 32: 156-166.
44. Lehner B, Wiltfang J, Strobel-Schwarthoff K, Benz M, Hirschfelder U, Neukam FW. Influence of early hard palate closure in unilateral and bilateral cleft lip and palate on maxillary transverse growth during the first four years of age. *Cleft Palate Craniofac J* 2003; 40: 126-130.

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- ประหยัดเวลาทางคลินิกจากการใช้ขั้นตอนแบบ manual
- ทำความสะอาด instruments โดยอัตโนมัติได้อย่างมีประสิทธิภาพก่อนเข้าสู่โปรแกรม sterilization
- ฉีดน้ำมันหล่อลื่นให้โดยอัตโนมัติภายใต้ระบบปิด ช่วยให้เกิดการใช้ น้ำมันอย่างมีประสิทธิภาพและไม่เกิดการฟุ้งกระจายของละอองน้ำมัน โดยใช้ น้ำมันประมาณ 1 cc. ต่อครั้งสำหรับ Handpieces 6 หัว



Special design for handpieces and turbines

6 instruments are cleaned, lubricated and sterilized

0:00 - 0:30 Lid closes
0:30 - 1:20 Leak test

1:20 - 2:15 Internal cold cleaning

2:15 - 2:30 Lubrication

2:30 - 5:00 External cold cleaning

5:00 - 5:30 External hot cleaning

5:30 - 6:25 Heating procedure to 134°C

6:25 - 7:35 Back-flush

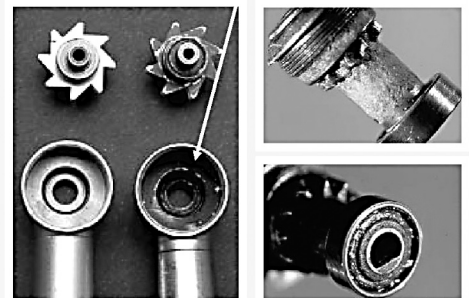
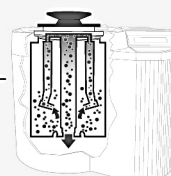
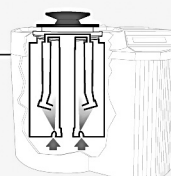
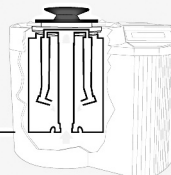
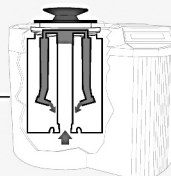
7:35 - 10:35 Sterilization

10:35 - 11:10 Back-flush

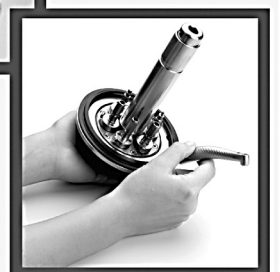
11:10 - 11:35 Drying

11:35 - 11:50 Lid opens a little bit

11:50 - 12:00 Lid opens after pressing C



ภาพเปรียบเทียบ Turbines ที่ผ่านการ sterilization 2 ภาพ
*ภาพซ้าย: Turbine ที่ผ่านการทำความสะอาด internal cleaning
*ภาพขวา: Turbine ไม่ผ่านการทำความสะอาด internal cleaning พบว่า Turbine ด้านขวา มี oil, debris, blood cells และ saliva ตกค้างอยู่หลัง sterilization



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ISO9001:2000
ISO13485:2003



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