

CORRECTIVE RHINOPLASTY OF THE POST-TRAUMATIC RESIDUAL NASAL DEFORMITIES

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Abstract

The major causes of the facial bone fractures are automobile collision, industrial or other accident, and fights.

Of the facial bone fractures, the nasal bone fractures are most common.

According to Schroeder et al., 50% of facial bone fractures are isolated fractures of the nasal pyramid. But the fractured nasal bone is not immediately treated as other facial bone fractures. And it is necessary to delay the treatment of the combined nasal bone fractures with other jaw bone fractures because of the difficult anesthetic techniques. Therefore there are many residual nasal deformities following a fracture; nasal hump, saddle nose and alar rim defect. Many authors have suggested the methods to correct the post-traumatic nasal deformities. We have treated several patients with several methods and this paper presents the operating methods and results.

INTRODUCTION

The fractures of the nasal bone occur most often because of its prominent projection on the face⁵⁾. According to Schroeder et al., 50% of facial bone fractures are isolated fractures of the nasal pyramid¹⁶⁾. But the fractured nasal bone is not immediately treated as other facial bone fractures. And it is necessary to delay the treatment of the combined nasal bone fractures with other jaw bone fractures because of the difficult anesthetic techniques. Therefore there are many residual nasal deformities following a fracture. The deformities may be related to¹⁵⁾ 1) the external nasal framework, 2) the posterior ethmoido-maxillary bony base, and 3) the superior fronto-

ethmoidal osseous complex.

In the complex deformities, it is necessary to correct all the areas involved.

The external nasal deformities are the consequence of a displacement of the bony and cartilaginous components of the nasal framework. The skeleton of the nasal bridge and lateral walls combines to give the nose its particular shape, a feature of the fundamental and indeed, primordial aesthetic importance in the composition of the individual face.

Therefore the exact correction of the residual nasal deformities is important to Oral and Maxillofacial Surgeons.

There are many post-traumatic nasal deformities: nasal hump, saddle nose, and alar rim defect. Espe-

cially, to Oral and Maxillofacial Surgeons saddle nose deformities are most interesting. Many authors have suggested the methods to correct the post-traumatic nasal deformities. We treated 6 patients with several methods and this paper presents the operating methods and results.

MATERIALS AND METHODS

The study consisted of 6 patients who were injured in traffic accidents and industrial accidents. We treated these patients with silastic implantation, cartilage graft, bone and cartilage complex graft, and intraoral nasal bone osteotomy at the Department of Dental and Oral and Maxillofacial Surgery in Chung-Nam National University Hospital.

1. Silastic augmentation

Under the general anesthesia via orotracheal intubation, the patient was placed in the supine position. The face was prepared and draped in a routine fashion. The both nostrils were cleansed with H_2O_2 and povidone. Local anesthetic with vasoconstrictor was infiltrated into the both nostril, nasal tip, and dorsum for superficial bleeding control during operation.

The intracartilaginous incision was made on both nostrils.

With scissors, the soft tissues over the alar and lateral cartilages were undermined (Fig. 1). The scissors were extruded through the intracartilaginous incision on the contralateral side. The incision was extended to the septal angle and downward along the caudal border of the septum. We used the sharp periosteal elevator for the periosteal incision. The tip of the periosteal elevator palpated the lower border of the nasal bone and incised the periosteum.

The periosteal pocket was made over the both nasal bone by periosteal elevation. The previously carved silastic was inserted into the periosteal pocket (Fig. 2). The columellar part of the silastic was positioned between the medial crura of the alar cartilages and fixed by suturing the medial crura. The dorsal part

was fixed with transfixion suturing. The incision site was sutured by 4-0 black silk and fixed with casting splint.

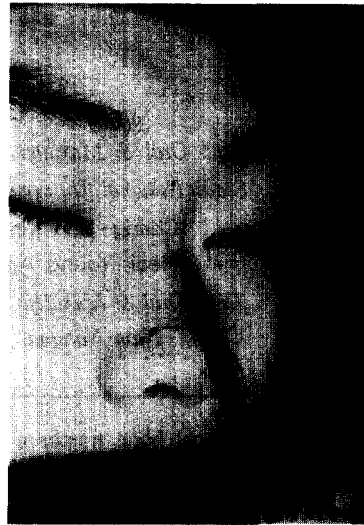


Fig. 1. Soft tissues over the alar and lateral cartilages were undermined with scissors.



Fig. 2. The previously carved silastic was inserted into the periosteal pocket.

2. Cartilage augmentation

The same procedures of the silastic augmentation were achieved for the formation of the periosteal pocket. Local anesthetic with vasoconstrictor was infiltra-

ted on posteromedial aspect of the ear for superficial bleeding control. Incision and dissection was made for exposure of the auricular cartilage. A spindle shaped cartilage was gained and carved to designed shape (Fig. 3). The carved auricular cartilage was inserted to the periosteal pocket and fixed with transfixion suturing on dorsum and suturing the medial crura. The incision site was sutured with 3-0 black silk and dressed with casting splint.

The donor site was sutured with 4-0 black silk and dressed with C.O.M dressing method.

3. Hump removal with rasp

Routine preparation was done for the operation.

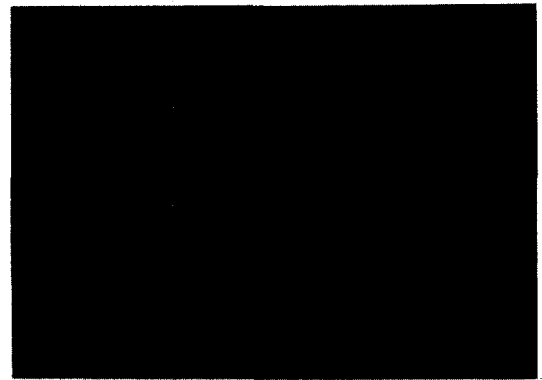
Intercartilaginous incision and undermining of the soft tissues over the lateral cartilages were made. The tip of the periosteal elevator palpated the lower border of the nasal bone and incised the periosteum. The upper part of the soft tissues over the nasal bone was elevated and hump was removed and contoured with rasp. The incision site is sutured with 4-0 black silk and the dorsum of the nose was dressed with casting splint.



Fig. 3. A spindle shaped cartilage was gained and carved to designed shape. A maximum size to be gained without any distortion of the ear is 25×8 mm.



1)



2)

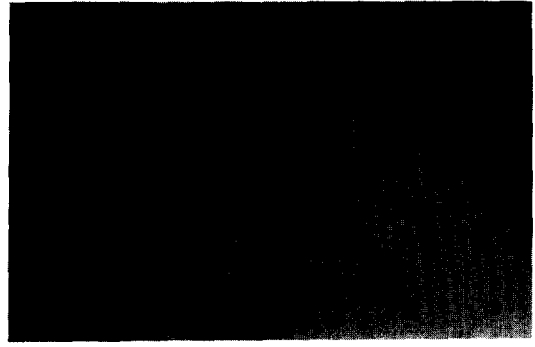
Fig. 4. This patient was treated by dorsal augmentation with iliac bone and columellar lengthening with auricular cartilage.

4. Bone and cartilage complex graft.

The routine preparation was done for the rhinoplastic operation. The intracartilaginous incision and routine preparation for the periosteal pocket were made. The previous designed iliac bone was gained by the routine method and inserted into the periosteal pocket. The auricular cartilage, carved to wanted form was inserted between the medial crura for columellar lengthening. The upper part of the grafted iliac bone (Fig. 4). The grafted iliac bone and cartilage was fixed by the transfixion suturing on dorsum and columella.



Fig. 5. After grooving with pneumatic drill, cut the nasal process of the maxilla with saw through the intraoral vestibular incision.



Incision wound was sutured with 3-0 black silk and routine dressing with casting splint on dorsum of the nose was achieved.

5. Intraoral nasal bone osteotomy.

Under the general anesthesia via orotracheal intubation, the patient was placed in the supine position. Intraoral irrigation with H_2O_2 and saline was done, and then face was prepped and draped in a routine fashion. The both nostril were cleansed with H_2O_2 and povidone. Local anesthetics with vasoconstrictor was infiltrated into the upper labial vestibule for the superficial bleeding control.

Vestibular incision was made from Rt. to Lt. upper first molar. Blunt dissection and periosteal elevation were made for the exposure of the anterior nasal spine and both pyriform apertures. The periosteal elevation was continued to the inferior orbital rim and nasal root. The nasal bones and lateral cartilages were exposed completely.

And then, lateral nasal bone osteotomy was achieved at the lower part of the nasal process of the maxilla (Fig. 5). After infracture the osteomised nasal bones, medially and upwardly displaced the fragment and fixed by transfixion suturing and intranasal packing. The wound was closed with 3-0 black silk and dressed with casting splint and compression to both cheek areas.

DISCUSSION

The nose is in the shape of a pyramid, which is the most prominent and characteristic feature of the human face. The nasal bone fractures occur most often in the facial trauma. But the percentage of the early treatment of the fractured nasal bone is low because of the unawareness and difficult anesthetic techniques. Therefore Oral and Maxillofacial Surgeons are faced with many post-traumatic nasal bone deformities. Corrective surgery of the external nose is required for functional and esthetic reasons. The human nose is center of the face and especially the lower part of the nose is important in human impression and characteristics. Therefore the corrective rhinoplasties are difficult problems.

Rogers distinguished three basic racial nose types; the mesorrhines (the orientals), the leptorrhines (the caucasian), and the plathyrrhines (the negroid)¹⁴⁾. In other words, the leptorrhine is long and narrow, the plathyrrhine is wide and flat, and the mesorrhine is intermediate. Therefore, in the corrective rhinoplasty, it is important to consider the racial characteristics of the nose; the nasolabial angle of the orientals is 95 ± 5 in male and $95 + 12 - 25$ in female²⁰⁾.

Of the post-traumatic nasal deformities, the saddle nose deformities are most important. There are many methods in correction of the saddle nose. Generally

saddle nose is treated with augmentation method. Various implants have been used for many years.

They have included carved ivory, plastics, metals, silicone rubber, homogeneous and heterogeneous preserved bone and cartilage, and autogenous tissue graft. However, there is no "material for all reasons". Ideally, the tissue substitute should not be physically modified by soft tissue, capable of inciting on inflammation or hypersensitivity. It also should be chemically inert, noncarcinogenic, capable of resisting strain, capable of fabrication in the form desired and capable of sterilization¹⁾.

The most widely used implant may be classified into three types; autogenous bone, cartilages, and silastics⁴⁾. Many reports of nasal reconstruction with a bone graft has been first report by Ollier in 1864¹²⁾. The grafts were obtained from the ilium⁶⁾, the skull¹⁷⁾, anterior tibia, and mastoid bone. Ervin, S. Wheeler, et al., believed that autogenous bone was best available material⁹⁾. Its advantage is a complete union with the osseous part of the nasal dorsum. But it is less commonly used because of their unnatural hardness and rigidity.

On the other hand, cartilage has essential advantage. It possesses a consistency and elasticity that is physiologic for the nose; it is easily carved into the desired shape, the healing process is practically without problems, and it can be equally applied well in all different kinds of recipient beds found in the nose¹³⁾. Cartilage graft have been used by Metzemaubum¹¹⁾, Cohen⁶⁾, and others²⁻⁹⁾ for nasal reconstruction. Though both bone and cartilage graft have special advantages, they have considerable problems; the possibility of partial resorption, risk of infection, and distortion of the grafted material¹³⁾.

At the present time, medical grade silicone rubber has been used the most frequently for nasal augmentation, since it is heat - stable, time - stable, not adherent, not attached or altered by the body, and elicits minimal tissue reaction. However, there are some drawbacks, the worst being a possible extrusion¹⁹⁾.

For the approach to rhinoplasty, many incisions have been used.

These are¹³⁾ (Fig. 6) ;

1. Erich incision (translobular)
2. Rethi incision (transcolumellar)
3. Rethi - Meyer incision
4. transfixion incision
5. basal incision (Cronin)
6. mid - columellar incision
7. intercartilaginous incision
8. intracartilaginous incision
9. marginal incision
10. infracartilaginous incision
11. Gillies - Potter incision
12. marginal columellar incision
13. buffalohorn - shaped incision
14. horizontal glabellar incision
15. canthal incision
16. intraoral vestibular incision^{3, 18)}.

Generally the intercartilaginous incision, intracartilaginous incision, infracartilaginous incision, and marginal incision are used in corrective rhinoplasty. Since, the operative field is not observed directly in these incisions, expert technique is necessary during operation. Therefore it is difficult to gain satisfactory results in the cases that had comminuted fractures or great osteocartilaginous hump¹³⁾. If these patients, midface degloving procedure (intraoral vestibular incision introduced by Casson, et al.) is necessary.

We used the intercartilaginous incision for the removal of the hump, the intracartilaginous incision for the augmentation, the infracartilaginous incision for the lengthening of the columella, and intraoral vestibular incision for the restoration of the impaired nasal function, especially nasal obstruction by nasal bone osteotomy. In augmentation rhinoplasty, various implants have been used for many years. We used iliac bone, auricular cartilage, and silastics in 6 patients. Generally intercartilaginous or intracartilaginous incision are made but in the case that requires the correction of the nasal tip, the intracartilaginous is

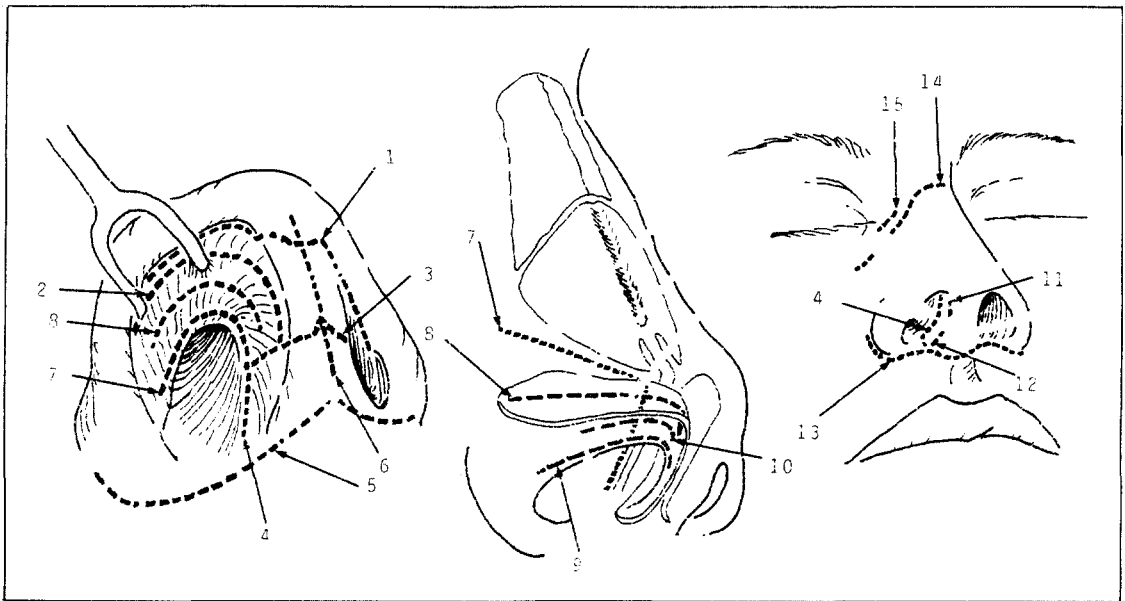


Fig. 6. Internal and external incisions for rhinoplasty.

more favorable. The incision is made unilaterally or bilaterally in nostril. If the graft is small in size, it may be good to access unilaterally, but if the graft is moderate or large size, the incision must be made bilaterally. If the incision is made unilaterally in latter case, the undermining should be continued to opposite site of the nasal tip, the implant may be deviated from incision site caudally to opposite site proximally.

It is important to fix the implant in accurate position. In the cartilage or silastic graft, two needle threaded with 4-0 nylon monofilament thread is placed on proximal edge of the implant, and, two needles are inserted through the periosteal pocket to fix at the proximal point on the skin which is previously marked¹⁰. And then, two thread ends are fixed to the skin with micropore tape. Distally, the distal tip of the implant is positioned between the medial crura and fixed by suturing the medial crura (Fig. 7). In other method, the implant is fixed to nasal bone by puncturing the implant with 20G disposable needle¹⁹. For the fixation of the bone graft, a wire is drilled through the nasal bone and then twisted (Fig. 3).

The columellar lengthening is also needed in some

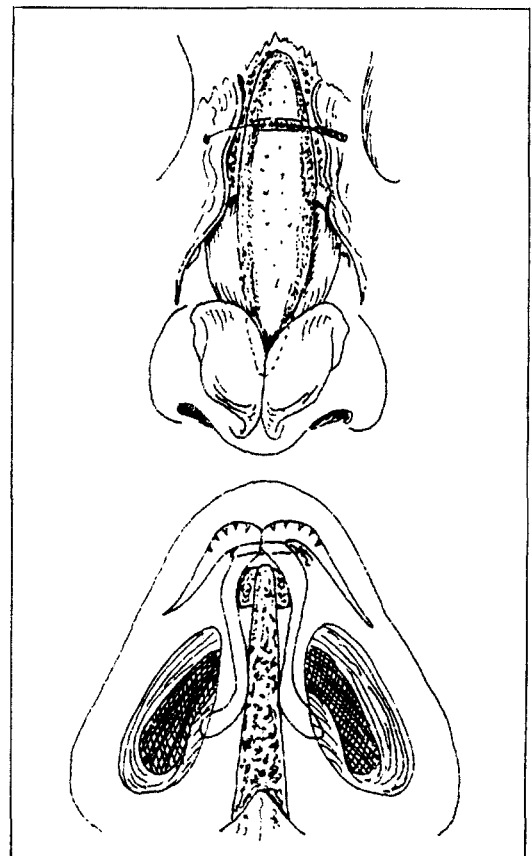


Fig. 7. Bone graft for the correction of the saddle nose and columellar lengthening.

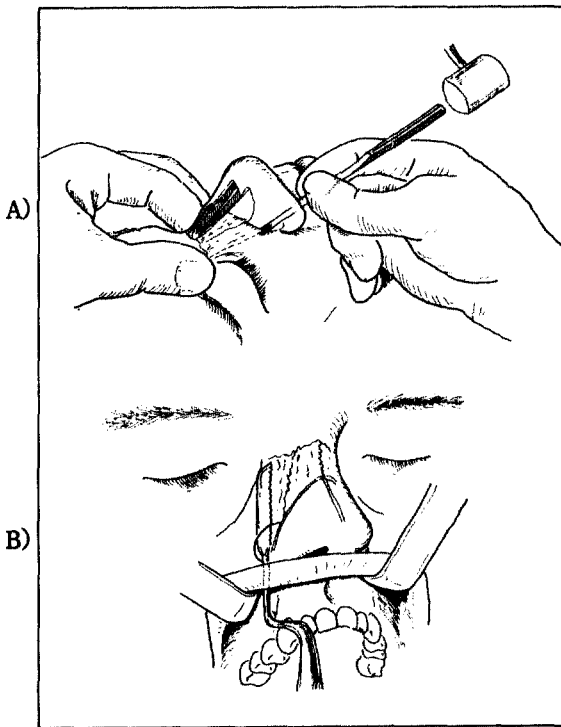


Fig. 8. A) Nasal bone osteotomy with internal approach.
 B) Intraoral nasal bone osteotomy by the saw technique.

cases. In these cases, the columellar is lengthened with variable implants; bone graft, cartilage graft, or silastics. The lower part of the nose is movable structures, so that it is prefer to use the movable implants, namely, silastics or cartilages. Therefore in correction of the saddle nose deformities, it is possible to use complex graft; bone - cartilage, bone - silastics, or silastics - cartilage graft.

We have used the auricular cartilage since it possesses a consistency and elasticity that is physiologic for the nose. The maximum size to be gained without distortion of the ear is $25 \times 8 \text{mm}^{19}$. Therefore, for major nasal defects, this source may be insufficient to restore contour. In these cases, autogenous bone graft is the best available material. We gained the graft from the iliac bone. Because human materials have some considerable problems; the possibility of

partial resorption, risk of infection, and distortion of the grafted materials, now, the silastics have been used the most frequently. Corrective surgery of the external nose is required for both functional and esthetic reasons.

If esthetics is only the main problem, it is enough to correct the problem by augmentation or columellar lengthening. But if the impairment of nasal function, especially nasal obstruction, is present, nasal bone osteotomy if necessary. Nasal bone osteotomy may be achieved by intranasal or intraoral approach (Fig. 8). In the cases that had comminuted fractures, the intraoral approach is better than intranasal approach. Our case that was injured by traffic accident is treated with intraoral nasal bone osteotomy. He had functional and esthetic problems. In first operation he had restored functionally and later was treated by augmentation. Osteotome, or saw is used for the nasal bone osteotomy. Prior to osteotomy, it is need to resect the upper part of the nasal bone and lateral cartilage for the lifting of the nasal bone. But in our case, it was unnecessary because he had comminuted fractures, so that the nasal bone is easily fractured and lifted with Walsam's forcep without resection. In these osteotomy procedures surgeons must take care of the lacrimal apparatus¹³. The osteotomy must be made through the thick portion of the nasal process of the maxilla in order to prevent "stair-step" deformity, and must be horizontal because if be oblique, the upward or downward force is applied in infracturing of the nasal bone (Fig. 9).

Corrective rhinoplasty is very difficult operation because it is a blind technique, nasal structure is very detail and complicate, and operative field is very small. Therefore if corrective rhinoplasty is achieved without precautions many complications are likely to occur^{7,13}. Necrosis of the skin results from the excessive pressure exerted by the graft. To avoid this complication, the implant should be reduced in size in order to minimize the pressure and the covering soft tissues of the nose should be undermined at a skeletal level. In the operation, the bleeding control is

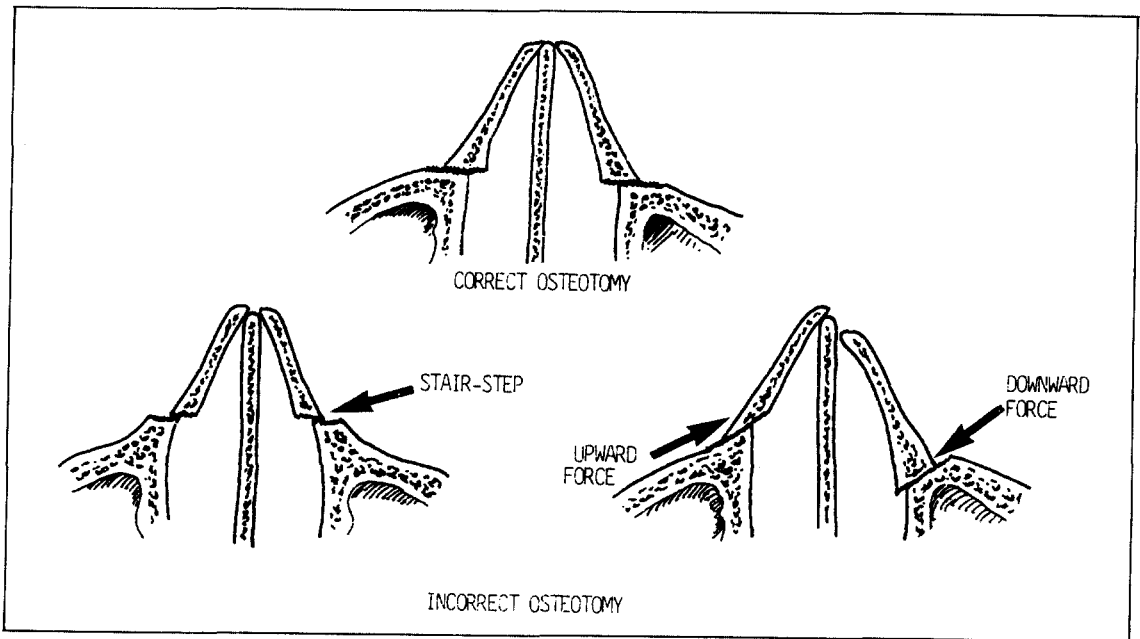


Fig. 9. Nasal bone osteotomy.

important. Infection and suppuration of the hematoma require removal of the implants. Lacrimal apparatus and olfactory nerve may be damaged. In conclusions, careful corrective rhinoplasty should give functional and esthetic results to patient without any complications.

SUMMARY

The fractures of the nasal bone occur most often because of its prominent projection on the face. But the fractured nasal bone is not immediately treated as their facial bone fractures because of unawareness and difficult anesthetic technique.

Therefore many residual nasal deformities are confronted by Oral & Maxillofacial Surgeons (fig. 10).

We treated 6 patients and gained satisfactory results;

1. hump removal,
2. intraoral nasal bone osteotomy,
3. silastic implantation - 2 cases,
4. auricular cartilage graft,

5. iliac bone and auricular cartilage complex graft.
- In summary, we are responsible for these post-traumatic deformities and should give functional and esthetic satisfactory results to patients.



Fig.10. Lateral photograph of pre - operative (Lt.) and postoperative state (Rt.) of patient.

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외상성 비변형의 이차적 정비술

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국문초록

사회가 다양해지고 공업화됨에 따라 안면부의 외상이 크게 증가하였으며, 그 외상 정도 또한 더욱 심화되었다. 안면골절중 가장 많은 발생빈도를 차지하는 것은 비골골절이다. 그러나, 골절된 비골에 대한 즉시 치료율은 다른 안면골에 비해 높지 않다. 또한 다른 안면골 골절, 특히 악골 골절과 동반된 경우에 있어서는 마취 기술상 동시 수술이 쉽지 않다. 따라서 많은 수의 비골골절이 즉시 치료되지 못해 변형된 형태로 남게 된다.

이러한 외상성 비변형은 심미적으로나 기능적으로 환자에게 큰 불편을 초래하므로 정비술을 요하게 된다. 코의 외상성 변형은 크게 비골부변형, 비연골부 변형, 피부변형과 다른 주위 구조물(안와부, 전두부)과 동반된 변형으로 나눌 수 있다. 안와부 또는 전두부와 동반된 비변형에 있어서는 비안각 또는 전비각의 재건에 유의하여야 한다. 단순한 비변형에 있어서는 비연골간 절개 또는 구내절개술을 통한 재건술이 많이 이용된다. 정비술 방법으로는 비골절단술, 연골이식술, 골이식술 및 이물질 매식술 등이 있다.

본원에서는 비연골간 절개를 이용한 골 및 연골이식과 이물질 매식 그리고 구내절개를 이용한 골절단술로 외상성 비변형을 이차적으로 재건한 바 만족할만한 결과를 얻었기에 이에 보고하는 바이다.