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A simple technique for the correction of maxillonasal dysplasia using customized expanded polytetrafluoroethylene (ePTFE) implants

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KEYWORDS

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Summary *Background:* The treatment of maxillonasal dysplasia in Binder's syndrome using autologous costal bone and cartilage is well established, but postoperative results may be compromised by scarring, unpredictable absorption of transferred autologous tissue, and donor site morbidity. Here, we propose a simple surgical technique to improve maxillonasal dysplasia using an expanded polytetrafluoroethylene (ePTFE) implant.

Materials and methods: From February 1999 to May 2014, fifty-eight patients affected by maxillonasal dysplasia with different degrees of flattened nose and midfacial depression underwent surgical correction by augmentation of the nasal dorsum using an "L"-shaped ePTFE and subperiosteal implantation of an inverted "m"-shaped ePTFE at the base of the piriform aperture. The outcome was evaluated based on preoperative and postoperative patient pictures, 3D imaging technology for the assessment of nasolabial angle and facial convexity angle, and a postoperative patient satisfaction survey.

Results: Postoperative results showed improved facial aesthetics with a significantly increased nasolabial angle from initially $74.1^\circ \pm 8.9^\circ$ to $93.7^\circ \pm 6.1^\circ$ at 6 months postoperatively ($p < 0.05$). Temporary discomfort involving upper lip numbness, foreign body sensation, and stiff smiling expression were complained during the first 3 months postoperatively, but

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spontaneously resolved within 6 months. Complications included infection (2 cases), implant migration (2 cases), and implant exposure (1 case). The vast majority of patients (95.7%) rated their postoperative outcome as highly improved and improved.

Conclusion: The present therapeutic strategy provides a simple and effective treatment for the correction of maxillonasal dysplasia with high patient acceptance in a single step approach. Further research is required to determine long-term outcomes.

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Introduction

Binder's syndrome first described in 1934 is a congenital deformity of the maxillofacial area. The main clinical manifestations include midfacial depression, acute nasolabial angle, short columella, flat nasal dorsum and tip.^{1–3}

A number of different surgical approaches for correction have been proposed including osteotomy of nasal base and maxilla and grafting of autologous tissue, i.e. bone and cartilage.^{4–7} Although effective in improving facial aesthetics, they often involve prolonged recovery time. Moreover, the transfer of autologous tissue is inevitably associated with donor site morbidity and unpredictable graft absorption which are unacceptable for many patients. This has directed the attention to the use of alloplastic material.

In this study, we analyzed patients seeking treatment for maxillonasal dysplasia and propose a simple method for effective correction using ePTFE implants. We here describe the surgical technique, discuss complications, and demonstrate postoperative early and long-term outcomes.

Material and methods

From February 1999 to May 2014, fifty-eight (19 men and 39 women) presenting with different degrees of Binder's syndrome characterized by flattened nose and midfacial depression were included in this study which was approved by the ethics committee of Shanghai Jiao Tong University Medical School. Patient age ranged from 17 to 51 years at the time of surgery with a mean age of 27.3 ± 6.8 years. All patients were previously examined at the dental clinic to exclude severe malocclusion. To confirm the clinical diagnosis of Binder's syndrome, patients underwent X-ray and 3D CT reconstruction.

The surgical procedure was performed by the same surgeon after informed consent had been given by the patient. Standard patient pictures were taken before surgery and during postoperative follow-up at 3 and 6 months. At the same time points, the nasolabial angle determined by columella, subnasale, and labrale superius (Cm–Sn–Ls), and the angle of facial convexity based on glabella, subnasale, and pogonion (G–Sn–Pog') were calculated and compared using three-dimensional simulation technology and computer imaging (Figure 1A, B).

Preoperatively, nasal skin quality and elasticity was by pulling the nasal tip forward to determine the maximum degree of maxillonasal augmentation.

Surgical technique

Local anesthesia was applied alone or in combination with general anesthesia or intravenous sedation. The ePTFE material (Shanghai Suokang Medical Implants, Shanghai, People's Republic of China) was carved into "L" and inverted "m"-shaped implants in consideration of the severity of maxilla-nasal dysplasia, nasal columella deficiency, maxillofacial symmetry, and the extent of midfacial and nasal depression in relation to ideal nasal length and height (Figure 2A, B). The "L"-shaped ePTFE implant was applied for nasal dorsal augmentation and adapted from a preformed shape. The "m"-shaped ePTFE implant was carved from a block and used to treat midfacial depression. Both implants were placed independent of each other.

Regarding implant design, the horizontal extent of the inverted "m"-shaped ePTFE was determined by the width of both lateral alae, while the height was defined by the vertical extent of midface depression. The middle ridge of the inverted "m" was adjusted to fit the caudal anterior nasal spine. According to the degree of midfacial depression and nasal columella deficiency implant thickness was increased in more severe cases. Each lateral ridge of the inverted "m" was positioned at rim of the piriform aperture. An implant of greater thickness was applied in cases of increased vertical height of the maxillomandibular arch and/or severity of facial depression. A larger area of middle face depression was accommodated by increasing the width of the implant.

The design of the "L"-shaped ePTFE was symmetrically rounded at the dorsal edge. Any deviation or twisting after implant insertion was meticulously avoided to ensure the esthetic outcome. A strictly aseptic technique during the surgical procedure was pursued to prevent infection.

For implantation of the inverted "m"-shaped ePTFE a 3–4 cm horizontal incision of the mucosa 5 mm above the gingival sulcus was used. The submucous muscle was cranially dissected until the subperiosteal plane was reached. Using a periosteum elevator the maxillary periosteum was freed at the base of piriform aperture and laterally to the alae to create an implant pocket. The dimensions of the subperiosteal pocket were 2 cm laterally to the piriform aperture. In addition, the medial part of the periosteum was dissected towards the nasal cavity to increase the size of the subperiosteal pocket. The ePTFE implant was inserted under the periosteum with both lateral ridges extending laterally to the nasal ala. The

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