Cleft Palate Surgery with the Removal of Ent Pathology

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Abstract

The article presents the cleft palate elimination technology, which includes a cross-sectional intervention in ENT organs (bypass of the tympanic cavity, segmental or total adenotomy, etc.) with the restoration of the anatomy of the vomer and the reconstruction of the hard palate with a super-elastic low-profile implant based on nickelid titanium. The article describes the advantages of the developed method in comparison with the ones previously used.

1 Introduction

The problem of the patients' rehabilitation with the cleft of hard and soft palates until present continues to be of great relevance despite a large number of developments is devoted to its various aspects. One of the key moments affecting the outcome directly is a surgical method of treatment (uraniscoplasty) which task is to restore the anatomic features of all palate sections and to create the preconditions for achieving the adequate closing function of the velopharyngeal ring. After different kinds of surgical interventions the postoperative defects can often occur in the region of the anterior, middle and other parts of the hard palate or on the border of the hard and soft palates. According to different literature sources their number reaches more than 75% [1, 5, 6, 8–10]. In cases of the severe defects absence during the postoperative period inpatients remain or arise the violations of nasal breathing, rhinosinusitis, acute or chronic otitis media which is...
not associated with the anatomical abnormalities of the ENT organ son the part of the ENT organs elimination [7].

In order to eliminate the pathological changes of the ENT organs and prevent the postoperative defects in the patients with cleft palate the technology of uraniscoplasty using the shape memory materials was developed.

2 Experimental

The edges of the cleft are freshened, in the region of the lateral parts of the hard palate the mucous membrane and the periosteum according to Langenbeck are dissected and the cuts are carried out in the front and middle sections of the hard palate for the formation of muco-periosteal flaps using one of the known techniques (Zausaev V. I., 1953; Dubov M. D., 1960; Kabakov B.D., 1964; Muratov I.V., Kotov G. A., 1999) (in patients with bilateral clefts – from the right and left sides of the defect to form the muco-periosteal flap staking into account the cleft overlap due to mucous membrane and the periosteum of the inter-maxillary bones, the palatine and alveolar processes of the upper jaw (Fig. 1)). The muco-periosteal flaps are dissected from the palate and alveolar processes of the maxillary and the horizontal plates of the palatine bones. The muco-periosteal flaps are formed and mobilized in the anterior, middle and other parts of the hard palate. The neurovascular bundles are extracted and mobilized from the pterygo-palatal canals after their posterior walls resection, the lower part of the nasal cavity is mobilized, the muco-periosteal flaps are separated from the nasal mucosa in the hard and soft palate border area forward, the mucosa and submucous membrane in retromolar areas up to the lingual surface of the alveolar process of the mandible are cut and the hooks of the sphenoid bone pterygoid processes are exposed. The soft tissues are separated from the latter in the interfascial space layer and are separated from the internal surface of the sphenoid bone inner plate before attachment m. pharingo-palatini without changing the place of attachment m. tensor velipalatini. In the area of the vomer defect the mucosa of the ethmoid bone vertical plate is separated subperiosteally from both sides by 0.4–0.8 cm and subperiosteally in the zone of the vomer defect and the hard palate bones from the lower surface the tissue nickelid titanium implant is inserted which was developed at Research Institute of Medical Shape Memory Materials and Implants (Tomsk) made of nickelid titanium yarn 50–60 microns in diameter with the cell size less than 240 mkm consisting of 2 part soft-like form, fixed between each

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other in the upper part by the nickelid titanium thread (Fig. 2). The upper part of the implant should correspond to the shape of the vomer defect, the lower part – to the total width of the hard palate muco-periostal flaps. The flaps of the soft palate are sutured between each other in three layers. The muco-periostal flaps of the hard palate are sutured (fissuroraphy). The wounds are sutured in the area of the pterygoid-mandibular spaces taking into account the palate retransposition by interrupted sutures tightly (Fig. 3). The additional fixation of the muco-periostal flaps is performed by iodoform strips and a removable protective plate.

Fig. 1. The state of the hard palate before the surgical treatment
In all cases the paracentesis of the tympanic membranes is performed with the subsequent evacuation of mucous or muco-purulent contents from the tympanic cavities and the bypass of the last ones. In cases of reduced volume of inferior nasal meatus due to the maxilloturbinal bone hypertrophy to prevent the impaired nasal airflow, on the medial surface of the anterior end of the maxilloturbinal bone the application is performed by the tip of the laser quartz light guide with 0,5 mm in diameter and the laser radiation by a Nd-Yag-laser with a wavelength 0,89 microns, the capacity of 20 Watts in interrupted mode, with the light guide advancement in the submucous membrane parallel to the bony frame and the mucosa on the entire length of the nasal turbinate with the speed 2 cm per second, then a hemostatic swab is inserted in the nasal cavity. Nasal septum deviation is eliminated by resection of the prominent aside section or by the dissection at the bottom, middle or upper part of the quadrangular cartilage. The hypertrophic changes of the pharyngeal tonsil are dissected completely or only in the projection of the auditory tubes orifices (in order to preserve the function of the velopharynx).

With the use of this technology the treatment of 18 patients with unilateral and bilateral clefts of the hard and soft palate was implemented. When assessing the short-term anatomical outcomes it was detected that the immediate postoperative period was always accompanied by as light inflammatory reaction in the

Fig. 2. The state after the installation of the tissue titanium nickelide implant in the defect zone

Fig. 3. The state after fissuroraphy
intervention area which was mainly eliminated by 7-8 days. In 16 patients (88.9%) the primary wound healing along the middle line was determined, in 2 cases (11.1%) the partial suture line disruption was observed with the tissue nickelid titanium implant exposure and the secondary wound healing along the implant material which consequentially resulted in the oronasal message elimination.

The analysis of the remote anatomic results (3 years) showed that in the region of the hard palate in the median palatine suture projection the state of a postoperative scar was satisfactory (Fig. 4). In the areas of the secondary healing (the palatine processes of the maxilla and horizontal plates of the palatine bones) the moderately expressed hypertrophic scar deformity of the hard palate mucosa was defined. The soft palate rigidity is insignificant. In anterior rhinoscopy the hypertrophic scar deformity of the inferior nasal meatus in the projection of the cleft was not determined, any anatomical and functional disorders on the part of the ENT organs, hard and soft palates associated with the surgery were not marked.

Fig. 4. The state of the patient 3 years after the surgical treatment: a - the oral cavity; b - the hard palate; c - left nasal passage

3 Summary

The advantages of the proposed technology if compared with those previously known ones are that the installed tissue of nickelid titanium between the mucoperiosteal flaps, the bone part of the hard palate and the floor of the nasal cavity due to biochemical and biomechanical compatibility with the body tissues, the properties of liquid retention ensures the restoration of the mucous membrane of the nasal passage bottom, isolate safely the oral and nasal cavities in cases of the mucoperiosteal sutures disruption, the parts of the flaps necrosis. In these situations the replacement of the missing tissues along the implant material occurs
by the edge epithelialization of the oral and nasal mucous membrane on the exposed parts of the implant. The connective tissue from the recipient are as will in-grow through the cellular implant structure with the formation of the single connective tissue regenerate in the zone of the former defect. The lack of necessity regarding the inverting sutures on the mucous membrane of the nasal cavity floor considerably reduces the time characteristics of the surgery, prevents the hypertrophic scar deformity and the inferior nasal meatus narrowing. The cross-sectional elimination of the pathological conditions on the part of the nasal cavity organs provides the nasal breathing normalization, prevents the development of rhinosinusitis. The segmental adenotomy enables to normalize the functional characteristics of the auditory tubes without causing the functional velopharynx in sufficiency.

References


