DOI: https://doi.org/10.17816/PTORS73184

Lower jaw reconstruction using a vascularized bone graft is the main stage of complex rehabilitation of a child with lower jaw osteoblastoclastoma

Mikhail G. Semyonov[1, 2], Sergei I. Golyana[1], Vasily V. Michalov[2], Konstantin A. Afonichev[1], Olga V. Fillippova[1], Yulia V. Stepanova[1]

[1] H. Turner National Medical Research Center for Children's Orthopedics and Trauma Surgery, Saint Petersburg;
[2] North-Western State Medical University named after I.I. Mechnikov, Saint Petersburg

BACKGROUND: Jaw bone benign tumors and dysplasia in childhood often have an aggressive growth pattern, which requires early radical operations. Uneven growth and changing morphological characteristics of the child's dentofacial apparatus imply stage-by-stage bone and plastic surgery in the maxillofacial region.

CLINICAL CASE: The paper presents a clinical observation of the medical rehabilitation of a patient from 5 to 24 years old with lower jaw osteoblastoclastoma following our proposed algorithm.

DISCUSSION: The presented clinical observation demonstrates all the main stages of medical rehabilitation of a child with a benign lower jaw neoplasm. Along with timely and fully operative neoplasm removal, rational dental prosthetics, and dispensary observation with X-ray diagnostics play an important role in the child's growth period. All these measures were important to prevent a possible neoplasm recurrence, partially maintain the masticatory function for the growth period, and avoid secondary postoperative dental apparatus deformities. The age of repeated surgery to replace the titanium structure with autosteal tissue depends on the individual characteristics of patients. The operation can be performed, in some cases, starting from age 16–17 years.

CONCLUSIONS: Successful treatment of children with benign neoplasms of the lower jaw after post-resection defects is a complex multi-stage process of medical rehabilitation, of which the completion, most often, passes into the adult period.

Keywords: children; jaw neoplasm; stages of rehabilitation; reconstruction; vascularized graft.

To cite this article:
Semyonov MG, Golyana SI, Michalov VV, Afonichev KA, Fillippova OV, Stepanova YuV. Lower jaw reconstruction using a vascularized bone graft is the main stage of complex rehabilitation of a child with lower jaw osteoblastoclastoma. *Pediatric Traumatology, Orthopaedics and Reconstructive Surgery.* 2021;9(4):455–464. DOI: https://doi.org/10.17816/PTORS73184

Received: 30.06.2021 **Accepted:** 11.10.2021 **Published:** 28.12.2021

ECO•VECTOR

УДК 616.716.4-006.342-053.2-089.844
DOI: https://doi.org/10.17816/PTORS73184

Реконструкция нижней челюсти с использованием васкуляризированного костного трансплантата — основной этап комплексной реабилитации ребенка с остеобластокластомой нижней челюсти

М.Г. Семенов[1, 2], С.И. Голяна[1], В.В. Михайлов[2], К.А. Афоничев[1], О.В. Филиппова[1], Ю.В. Степанова[1]

[1] Национальный медицинский исследовательский центр детской травматологии и ортопедии имени Г.И. Турнера, Санкт-Петербург, Россия;
[2] Северо-Западный государственный медицинский университет имени И.И. Мечникова, Санкт-Петербург, Россия

Обоснование. Доброкачественные опухоли и дисплазии челюстных костей в детском возрасте часто проявляют агрессивный характер роста, в связи с чем необходимо выполнение ранней радикальной операции. Неравномерный рост и меняющиеся морфологические характеристики зубочелюстного аппарата ребенка подразумевают проведение этапных костно-пластических операций в челюстно-лицевой области.

Клиническое наблюдение. В работе представлено клиническое наблюдение медицинской реабилитации пациентки с 5-летнего возраста до 24 лет с остеобластокластомой нижней челюсти.

Обсуждение. Рассмотрены основные этапы медицинской реабилитации пациента детского возраста с доброкачественным новообразованием нижней челюсти. Наряду со своевременным оперативном удалением новообразования в полном объеме важную роль в период роста ребенка играет рациональное зубное протезирование, диспансерное наблюдение с рентгенодиагностикой. Эти мероприятия важны для предупреждения возможного рецидива новообразования, осуществления жевательной функции и недопущения вторичных послеоперационных деформаций зубочелюстного аппарата. Возраст проведения повторной операции с целью замены титановой конструкции на аутокостную ткань зависит от индивидуальных особенностей пациента. Операция может быть выполнена в ряде случаев начиная с 15–17-летнего возраста.

Заключение. Лечение детей с доброкачественными новообразованиями нижней челюсти при пострезекционных изъянах и дефектах — сложный многоэтапный процесс комплексной медицинской реабилитации, конечным этапом которой является полное восстановление жевательной функции после зубного протезирования на дентальных имплантатах.

Ключевые слова: дети; новообразование челюсти; этапы реабилитации; реконструкция; васкуляризированный трансплантат.

Как цитировать:
Семенов М.Г., Голяна С.И., Михайлов В.В., Афоничев К.А., Филиппова О.В., Степанова Ю.В. Реконструкция нижней челюсти с использованием васкуляризированного костного трансплантата — основной этап комплексной реабилитации ребенка с остеобластокластомой нижней челюсти // Ортопедия, травматология и восстановительная хирургия детского возраста. 2021. Т. 9. № 4. С. 455–464. DOI: https://doi.org/10.17816/PTORS73184

Рукопись получена: 30.06.2021 **Рукопись одобрена:** 11.10.2021 **Опубликована:** 28.12.2021

ЭКО•ВЕКТОР

BACKGROUND

Treatment of pediatric patients with benign neoplasms of the jawbones is one of the most urgent and complex problems of modern reconstructive plastic surgery of the maxillofacial region [1–3].

A few studies have focused on the analysis of the treatment of children and adolescents with post-resection defect and lower jaw defects in both Russian and international literature [4–6]. According to Afanasov et al. (2017), most authors present generalized treatment results of adult patients [7].

The complexity of this problem is attributed to several important and often mutually aggravating factors that are typical for patients in this category. Several benign neoplasms of the jawbones in children are characterized by a very aggressive growth pattern that can lead quickly to the destruction of dentition structures. Once such neoplasms are confirmed, radical surgery is required [8, 9]. Moreover, uneven growth and changes in the morphological characteristics of the jawbones in a child can lead to the need for performing staged osteoplastic surgeries, and the final reconstruction of the jaw is performed only after the completion of bone formation, e.g., lower jaw [10, 11].

Further, several authors consider it possible, after removal of the jaw neoplasm and the formation of a defect during surgery, to replace it immediately with a vascularized graft, without exclusion of subsequent repeated corrective osteoplastic surgeries. The use of a blood-supplied bone graft helps restore the integrity of the jaw during one surgical stage, regardless of the defect size. Most often, fragments of the fibula and radius, lateral edge of the scapula, and part of the ilium are used as donor materials. A considerable number of studies on transplantation of vascularized bone grafts in adults and, to a lesser extent, in children reported good aesthetic and functional results of treatment [11–14].

Moreover, the use of vascularized grafts to restore the integrity of extended mandibular defects in younger children, by both maxillofacial surgeons and pediatric orthopedists, raises several concerns related to the duration and trauma rate of surgery and the possible consequences of harvesting a large graft from a limb, which limited the use of early functional chewing load on the jaw after transplantation.

One of the most controversial topics regarding the complete medical rehabilitation of these patients is the restoration of complete chewing function using dentures on dental implants [15, 16].

CLINICAL CASE

Since 2013, five pediatric patients with post-resection jaw defects after removal of benign neoplasms were under our follow-up. Their jaw defects were successively compensated with standard and individual reconstructive plates (endoprostheses) and a free vascularized bone graft. Herein, we present one of the cases.

Patient B (5.5 years old) presented to the Pediatric Maxillofacial Surgery Clinic of K.A. Raukhfus Children's City Hospital No. 19 (St. Petersburg) in 2002 with complaints of impairment of facial contours, pain in the lower jaw, and eating difficulty. Clinical symptoms appeared a few months before the treatment. To clarify the diagnosis, the volume of the bone tissue damage was assessed, surgical treatment was planned, and orthopantomography and computed tomography (CT) of the skull were performed. The main diagnostic method was an extended surgical biopsy under

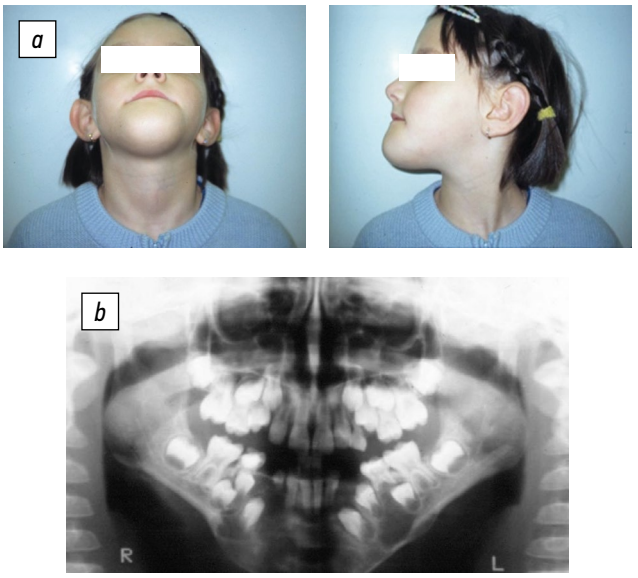

Fig. 1. Patient B (5.5 years old). Osteoblastoclastoma of the jaw: *a*, appearance; *b*, orthopantomogram

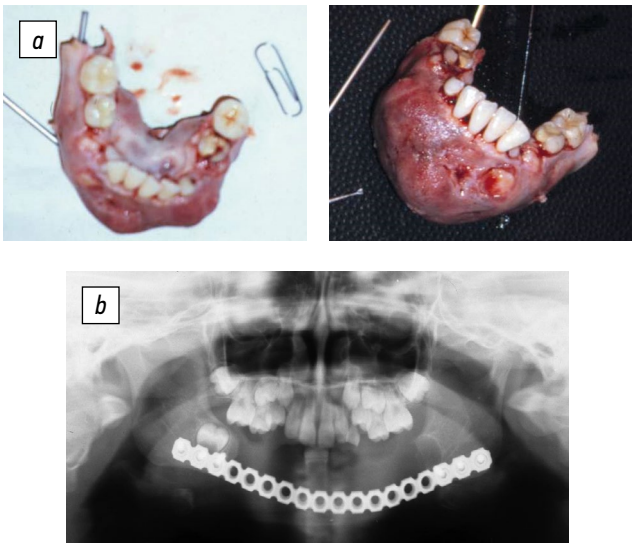

Fig. 2. Patient B (6 years old). Osteoblastoclastoma of the lower jaw: *a,* resection of the affected area; *b,* replacement of the jaw defect with a reconstructive plate

Fig. 3. Patient B (14 years old): *a,* stable remission 8 years after mandibular resection; *b,* partial restoration of chewing function with a removable denture

anesthesia, for which the patient was hospitalized for a short time. The study confirmed the preliminary diagnosis of a lower jaw osteoblastoclastoma (Fig. 1).

During the primary surgery, the neoplasm was removed in the volume of the affected segment of the jaw and within 8–10 mm of the intact bone tissue. The jaw defect was replaced with a titanium reconstructive plate (endoprosthesis) manufactured by Konmet and fixed on each side with three screws (Fig. 2).

The postoperative period was uneventful. After 2 months, a removable denture for the lower jaw was manufactured. In subsequent years, the patient was followed up by an orthodontist, who, as she grew, replaced a removable denture to maintain chewing function (Fig. 3).

At age 10, the patient underwent local plastic correction of the auricles due to everted ears. At age 17, upon completion of the growth of the facial part of the skull, preparations were started for the final surgery, including the removal of the titanium endoprosthesis plate and its replacement with a vascularized bone graft. The surgical treatment was indicated, among other things, as the jaw growth was completed. A CT scan showed a pronounced discrepancy between the size of the base (titanium endoprosthesis) of the lower jaw and the size of the formed upper jaw and the skull as a whole. Further preservation of the endoprosthesis could lead to the dislocation of the jaw heads from the articular cavities (Fig. 4).

During preparation for the surgery, before hospitalization, a CT of the skull and lower leg was performed. The prototype models of the upper and lower jaws, as well as a template for modeling during the fibula graft surgery, were constructed (Fig. 5).

The surgery was performed in the Department of Maxillofacial Surgery of the Turner Scientific and Research Institute for Children's Orthopedics by two teams of surgeons. One team prepared the receptive bed on the jaw after the removal of the titanium endoprosthesis and then

Fig. 4. Patient B (17 years old). Postoperative deformity of the lower jaw. Condition after the removal of the neoplasm and arthroplasty of the jaw with a titanium reconstructive plate: *a,* appearance and oral cavity; *b,* X-ray image

DOI: https://doi.org/10.17816/PTORS73184

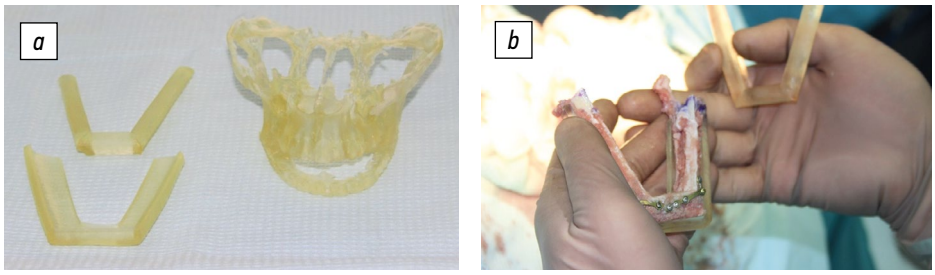

Fig. 5. Prototyping of the jawbones and model of the mandible template for the fibula graft (*a*); fragmented and modeled graft according to the jaw template (*b*)

modeled and fixed the bone graft on the jaw. Within 10 years of using a titanium endoprosthesis, under the action of masticatory muscles, a partial remodeling of the stumps of the resected fragments of the jaw occurred, and a bone "bridge" was formed between them. Team 2 of surgeons harvested the vascularized graft from the fibula and made anastomoses on the vessels of the graft and the receptive bed of the jaw. Thus, the surgery consisted of several successive stages, namely, skeletonization of the jaw with an endoprosthesis (the last one was removed), removal through an S-shaped incision in the projection of the fibula of the diaphysis, and addition of feeding vessels, namely, two veins and an artery with a diameter of up to 2.5 mm. Vessels were ligated and dissected, and a fibula fragment of 23 cm long was resected. Then, a transosseous canal was formed through the incision in the ankle area with fixation of the lateral ankle with a bone pin. Thereafter, an osteotomy, fragmentation of the bone graft according to the jaw template, and fixation of its fragments with mini-plates were performed. The integrity of the compact plate and periosteum on one side of the graft and, accordingly, the feeding vessels (arteries and veins) were preserved. The autogenous bone graft was placed along the edges of the fragments and on the surface of the jaw branches and fixed with five mini-plates with screws. Then, vascular anastomoses (9-0 Prolene) were placed between the proximal peroneal artery and the superior thyroid artery and between two more vessels of the donor and recipient

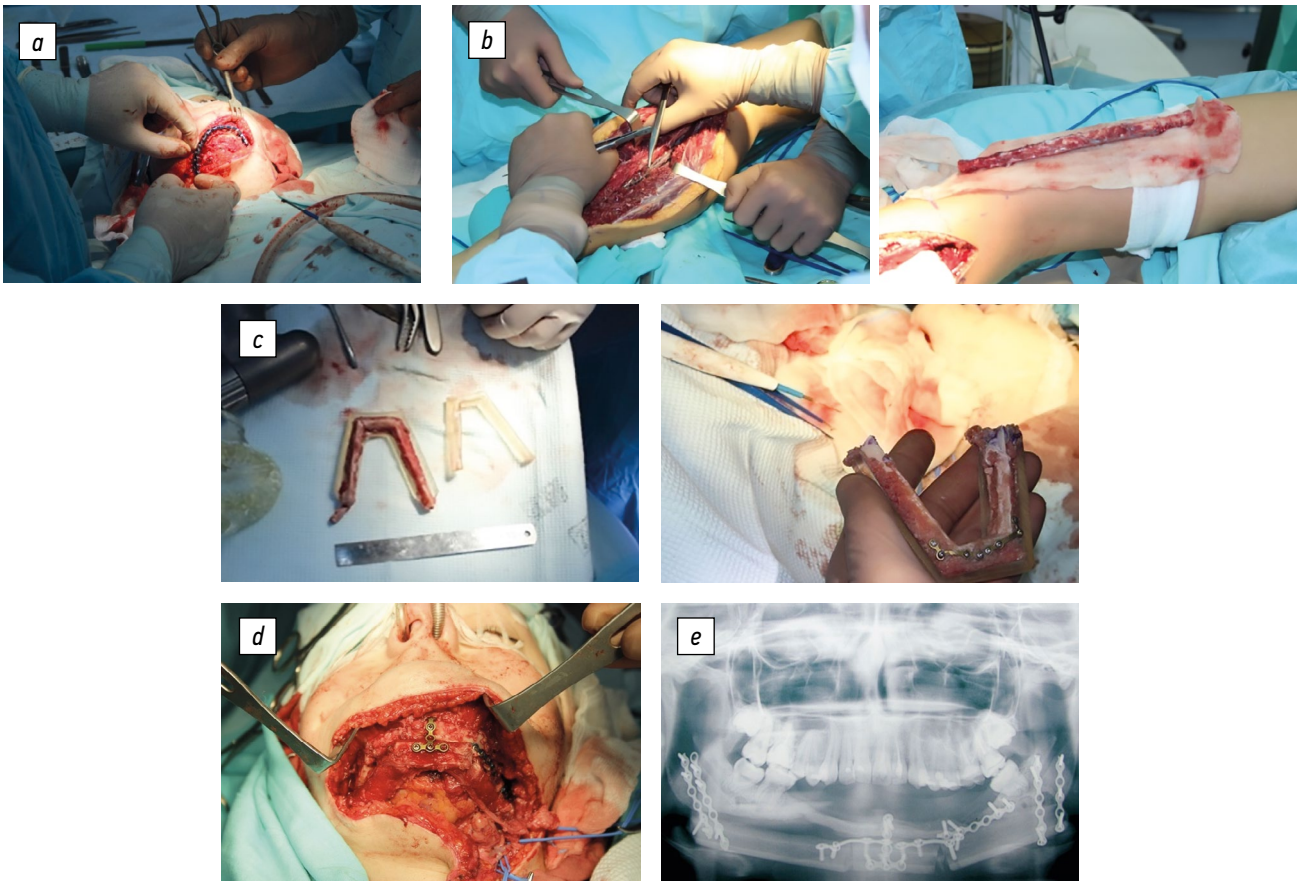

Fig. 6. Patient B (17 years old). Stages of bone grafting of the lower jaw with a vascularized fibula graft (*a–d*), and X-ray image of the immediate result of the surgery (*e*)

DOI: https://doi.org/10.17816/PTORS73184

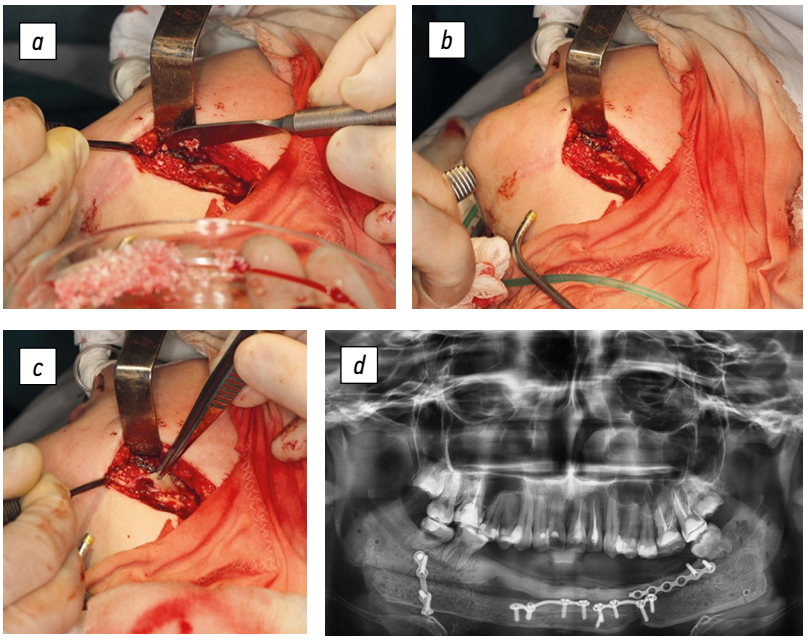

Fig. 7. Patient B (19 years old): *a,* removal of the hardware, additional fixation of the formed jaw with a mini-plate; *b, c,* bone grafting of small jawbone defects with xenogenic material "Osteomatrix," platelet-rich plasma, a biodegradable membrane is placed on top; *d,* X-ray image in the immediate postoperative period

zones. The patency test of the anastomoses was positive. Layered sutures were placed on the wound, with passive drainage (Fig. 6).

In subsequent years, the treatment was performed in an outpatient setting and in the Department of Maxillofacial Surgery of the Clinical Hospital "RZD-Medicina" in St. Petersburg.

At age 19 (2016), the patient underwent another surgery, when incisions were made on the scars in the submandibular region on both sides, the jaw was skeletonized, and two plates were removed from each side. A slight mobility of the edge of the formed jaw (former graft) on the right was revealed, and it was fixed with a mini-plate. A compact osteotomy of the jaw was performed, and cavities ("defects") between

Fig. 8. Patient B (21 years old), before dental implantation: *a,* appearance of the patient; *b,* oral cavity; *c,* removable prosthesis

DOI: https://doi.org/10.17816/PTORS73184

the formed jaw and the remaining fragments of the previously resected jaw (bone "bridge") were filled with xenogenic material "Osteomatrix" mixed with platelet-rich plasma (up to 4.0 cm^3). The implanted material was covered with membranes of platelet-rich fibrin and collagen resorbable membrane Biomatrix (Connectbiopharm). The wound was sutured (Fig. 7).

Over the next 3 years, because of family reasons, the patient postponed further rehabilitation of the masticatory function on dental implants, the follow-up was continued, and the patient wore a removable denture (Fig. 8).

At age 21 (2018), the patient underwent the next stage of rehabilitation. Five screw implants (Hi-Tek LGI line) were installed in positions 43, 44, 45, 33, and 34 of the teeth for a bar structure and fixation of a conditionally removable denture on it. Gum tissues were grafted in positions 33 and 34 of the dental implants with a free connective tissue flap (graft) from the hard palate mucosa. The wounds were sutured with 6-0 Prolene (Fig. 9).

In September 2020, the mobility of implant 45 was revealed; it was removed, and the bed was filled with Parasorb osteogenic material. Figure 10 presents the appearance and condition of the oral cavity. The patient had no complaints about functional and esthetic disorders of the lower limb.

In 2021, dental implantation in areas 45 and 35 with missing teeth was planned, followed by the manufacture of fixed dentures on six implants. The surgery was postponed because of the patient's pregnancy.

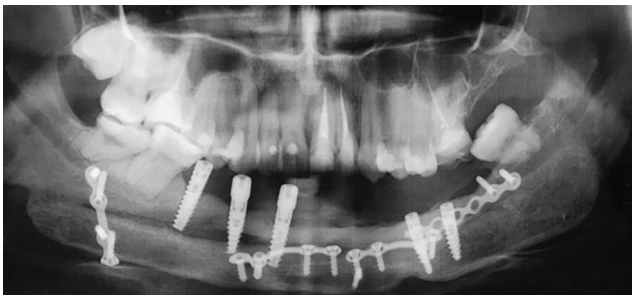

Fig. 9. Patient B (23 years old). After dental implantation

DISCUSSION

The clinical case presented herein demonstrates all the main stages of medical rehabilitation of a pediatric patient with a benign neoplasm of the lower jaw. In this case, the post-resection defect of the jaw was compensated with a reconstructive titanium plate, which reduces significantly surgical trauma at age 5 [3, 10, 11] compared with the use of a vascularized graft [4, 12–14] and allows early masticatory loading using a removable denture. Rational dental prosthetics is significant in the growth period of the child. During the 10-year follow-up period before the next reconstructive surgery on the jaw, four removable dentures were made for the patient; she underwent regular dispensary examinations with X-ray diagnostics. All these measures were important for the prevention of secondary postoperative deformities of the dentoalveolar apparatus and recurrence of a benign tumor; the rather high risk of which is

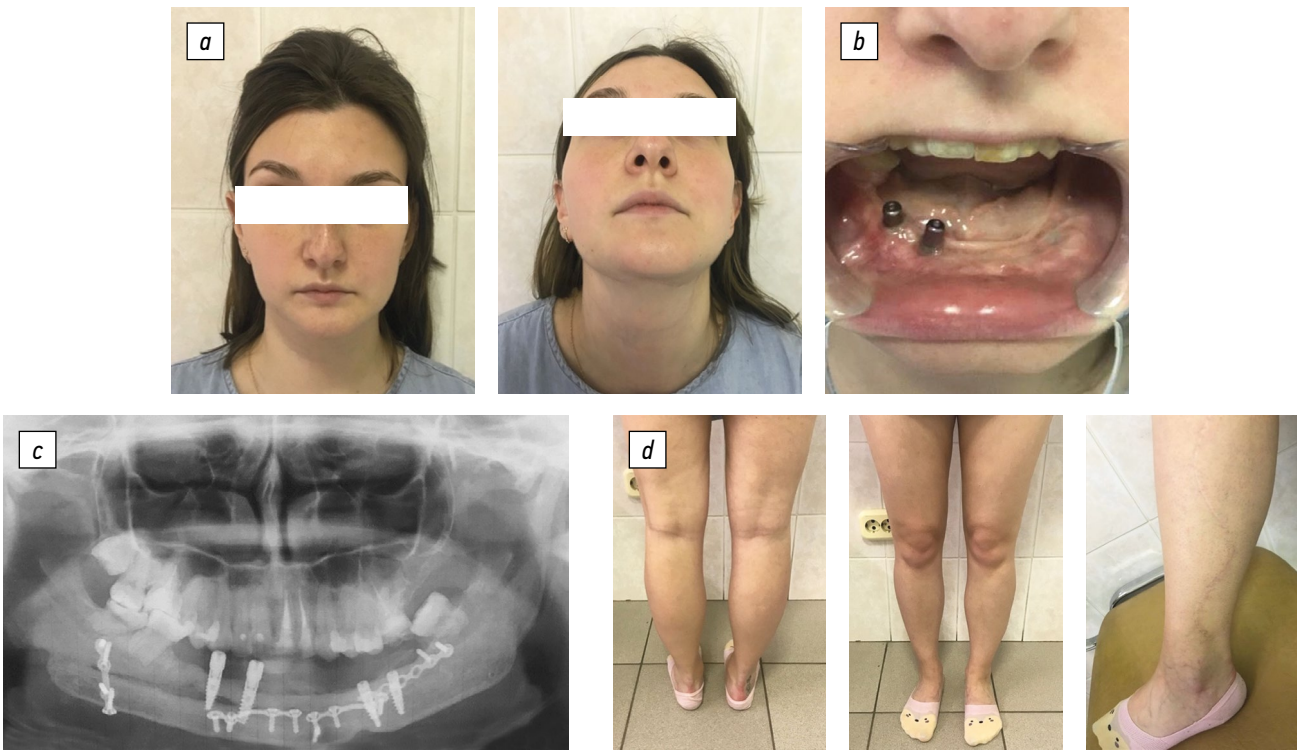

Fig. 10. Patient B (24 years old). Before the final stage of dental prosthetics: *a*, appearance; *b*, oral cavity state; *c*, X-ray image; *d*, lower limbs after fibular graft harvesting 7 years ago

indicated by the authors who monitored several children with neoplasms of the jawbones [1, 4–6], including those after reconstructions using vascularized grafts.

Thus, in our opinion, replacement of an extended post-resection jaw defect in some cases, especially in younger children (up to 5–7 years), can be started with the use of various reconstructive endoprosthesis plates, replacing them by age 15–17 with a vascularized (or non-vascularized) autobone. This minimizes the risks of primary transplantation of the vascularized bone after jaw resection and reaches the final reconstruction of the jaw with a clear understanding of the size, shape, and position of the proposed graft and dental implants.

The age at which a repeated surgery will be performed to replace the titanium reconstructive plate with an autologous bone graft depends on the characteristics of the patient; in some cases, the surgery can be performed at age 15–17. Subsequent medical rehabilitation and full restoration of masticatory function with the use of dental implants and fixed dentures are often determined by the patient's motivation, priorities during youth, and, of course, financial resources.

The analysis of our experience in treating such patients allows identifying several important tasks of the surgeons:

- Early and accurate verification of a neoplasm, including those with atypical hyperplastic inflammatory processes of the jaws.
- The use of informative and minimally invasive techniques for surgical biopsy.
- Computer modeling to determine the scope of surgical intervention and planning a reconstructive surgery to replace a jaw defect using stereolithographic models.
- The use of modern systems of reconstructive plates, individual endoprostheses to correct a defect, and jaw defect during primary surgery, especially in younger children (up to 5–7 years old).
- Development and improvement of techniques to correct an abnormality and/or defect of the jaw in older children with the use of vascularized grafts.
- Organization of a system of unified case follow-up with rational orthopedic and orthodontic treatment.
- Completion of medical rehabilitation with the restoration of the functional dentition in patients of this category, if possible up to age 18 years, which is of great medical and social importance.

CONCLUSION

Successful treatment of children with benign neoplasms and post-resection defect and lower jaw defects is a complex multi-stage process of complex medical rehabilitation, and its final stage is the complete restoration of the patient's masticatory function after placing dental prosthetics on dental implants.

ADDITIONAL INFORMATION

Funding. The work was performed within the state order No. 121031700123-3.

Conflict of interest. The authors declare no conflict of interest.

Ethical considerations. The patient provided consent for the publication of the clinical case description and photographs in the journal.

Author contributions. *M.G. Semyonov* performed surgical interventions as an operator, conducted postoperative patient management, tracked long-term results, collected and analyzed the data, and wrote the article. *S.I. Golyana* performed a part of the surgical interventions as an operator and wrote a part of the article. *V.V. Mikhailov* performed a part of the surgical interventions as an operator, tracked long-term results, and corrected the article. *O.V. Filippova* took part in the preparation of an analytical review. *K.A. Afonichev* analyzed the data, edited and corrected the text, and prepared the article for publication. *Yu.V. Stepanova* performed postoperative management of the patient and corrected the text.

All authors made a significant contribution to the study and preparation of the article, read and approved the final version before its publication.

REFERENCES

1. Kolesov AA, Vorob'ev JuI, Kasparova NN. Novoobrazovanie mjagkih tkanej i kostej lica u detej i podrostkov. Moscow: Medicina; 1989. (In Russ.)

2. Matjakin EG, Roginskij VV, Matjakin EE. Opuholi i opuholepodobnye obrazovanija cheljustno-licevoj oblasti. Rukovodstvo po hirurgicheskoj stomatologii i cheljustno-licevoj oblasti. Ed. by V.M. Bezrukova, T.G. Robustovoj. Vol. 1. Moscow: Medicina; 2000. (In Russ.)

3. Ovchinnikov IA, Roginskij VV, Sedyh AA, Ivanov AL. Hirurgicheskaja reabilitacija detej s defektami i deformacijami nizhnej cheljusti. In: Sbornik materialov Nauchno-prakticheskoj konferencii "Perspektivy razvitija poslediplomnogo obrazovanija specialistov stomatologicheskogo profilja. Aktual'nye problemy stomatologii: Tezisy dokladov. Moscow; 2003. P. 449–451. (In Russ.)

4. Genden EM, Buchbinder D, Chaplin JM, et al. Reconstruction of the pediatric maxilla and mandible. *Arch Otolaryngol Head Neck Surg*. 2000;126(3):293–300. DOI: 10.1001/archotol.126.3.293

5. Perry KS, Tkaczuk AT, Caccamese Jr JF, et al. Tumors of the pediatric maxillofacial skeleton: a 20-year clinical study. *Otolaryngology Head Neck Surg*. 2015;141(1):40–44. DOI: 10.1001/jamaoto.2014.2895

6. Benoit MMcK, Vargas SO, Bhattacharyya N, et al. The presentation and management of mandibular tumors in the pediatric population. *Laryngoscope*. 2013:123:2035–2042. DOI: 10.1002/lary.24020

7. Afanasov MV, Lopatin AV, Jasonov SA, Kosyreva TF. Metody ustranenija postrezekcionyh defektov u detej. *Russian Journal of Dentistry*. 2017;21(1):49–56. (In Russ.). DOI: 10.18821/1728-28022017;21(1):49-56
8. Paches AI. *Opuholi golovy i shei*. Moscow: Osobaja kniga; 2013. (In Russ.)
9. Abramowitz Sh, Goldwasser BR, Troulis MJ, et al. Primary jaw tumors in children. *J Oral Maxillofacial Surg.* 2013;71(1):47–52. DOI: 10.1016/j.joms.2012.04.045
10. Semenov MG, Filippova AV, Stecenko AG. *Sposob modelirovanija kostno-rekonstruktivnyh operacij pri lechenii novoobrazovanij cheljustnyh kostej v detskom vozraste*. Patent No. 2607651 RF. Zajavka No. 2015136960. 31 Oct 2015: opubl. 10 Jan 2017. (In Russ.)
11. Topol'nickij OZ. Kostnaja plastika nizhnej cheljusti u detej i podrostkov kompozitnymi m materialami na osnove akrilatov. [dissertation] Moscow; 2002.
12. Warren SM, Borud LJ., Brecht LE, et al. Microvascular reconstruction of the pediatric mandible. *Plast Reconstr Surg*. 2007;119(2):649–661. DOI: 10.1097/01.prs.0000246482.36624.bd
13. Bolotin MV, Lopatin AV. Microvascular reconstruction of defects of the mandible in children. *Opukholigolovyishei.* 2013;(2):16–19. DOI: 10.17650/2222-1468-2013-0-3-16-19
14. Guo L, Ferraro NF, Padwa BL, et al. Vascularized fibular graft for pediatric mandibular reconstruction. *Plast Reconstr Surg*. 2008;121(6):2095–105. DOI: 10.1097/PRS.0b013e3181712399
15. Nikitin DA, Mirgazizov MZ, Nikitin AA. Lechenie i reabilitacija bol'nyh posle kostno-rekonstruktivnyh i vosstanovitel'nyh operacij na nizhnej cheljusti s ispol'zovaniem jendoprotezirovanija i dental'nyh implantatov. *Al'manah klinicheskoĭ mediciny*. 2011(24):15–21. (In Russ.)
16. Markov NM, Grachev NS, Babaskina NV, et al. Dental rehabilitation in the complex treatment of children and adolescents with maxillofacial neoplasms. *Stomatologiia (Mosk).* 2020;99(6. Pt. 2):44–62. DOI: 10.17116/stomat20209906244

СПИСОК ЛИТЕРАТУРЫ

1. Колесов А.А., Воробьев Ю.И., Каспарова Н.Н. Новообразование мягких тканей и костей лица у детей и подростков. Москва: Медицина, 1989.
2. Матякин Е.Г., Рогинский В.В., Матякин Е.Е. Опухоли и опухолеподобные образования челюстно-лицевой области. Руководство по хирургической стоматологии и челюстно-лицевой области / под ред. В.М. Безрукова, Т.Г. Робустовой. Т. 1. Москва: Медицина, 2000.
3. Овчинников И.А., Рогинский В.В., Седых А.А., Иванов А.Л. Хирургическая реабилитация детей с дефектами и деформациями нижней челюсти // Сборник материалов Научно-практической конференции «Перспективы развития последипломного образования специалистов стоматологического профиля. Актуальные проблемы стоматологии»: Тезисы докладов. Москва, 2003. С. 449–451.
4. Genden E.M., Buchbinder D., Chaplin J.M. et al. Reconstruction of the pediatric maxilla and mandible // Arch. Otolaryngol. Head Neck Surg. 2000. Vol. 126. No. 3. P. 293–300. DOI: 10.1001/archotol.126.3.293
5. Perry K.S., Tkaczuk A.T., Caccamese Jr J.F. et al. Tumors of the pediatric maxillofacial skeleton: a 20-year clinical study // Otolaryngology Head Neck Surg. 2015. Vol. 141. No. 1. P. 40–44. DOI: 10.1001/jamaoto.2014.2895
6. Benoit M.McK., Vargas S.O., Bhattacharyya N. et al. The presentation and management of mandibular tumors in the pediatric population // Laryngoscope. 2013. Vol. 123. P. 2035–2042. DOI: 10.1002/lary.24020
7. Афанасов М.В., Лопатин А.В., Ясонов С.А., Косырева Т.Ф. Методы устранения пострезекционых дефектов у детей // Russian Journal of Dentistry. 2017. Т. 21. № 1. С. 49–56. DOI: 10.18821/1728-28022017;21(1):49-56
8. Пачес А.И. Опухоли головы и шеи. Москва: Особая книга, 2013.
9. Abramowitz Sh., Goldwasser B.R., Troulis M.J. et al. Primary jaw tumors in children // J. Oral. Maxillofacial. Surg. 2013. Vol. 71. No. 1. P. 47–52. DOI: 10.1016/j.joms.2012.04.045
10. Семенов М.Г., Филиппова А.В., Стеценко А.Г. Способ моделирования костно-реконструктивных операций при лечении новообразований челюстных костей в детском возрасте. Патент № 2607651 РФ. Заявка № 2015136960. 31.10.2015: опубл. 10.01.2017.
11. Топольницкий О.З Костная пластика нижней челюсти у детей и подростков композитными м материалами на основе акрилатов: автореф. дис. ... д-ра мед. наук. Москва, 2002.
12. Warren S.M., Borud L.J., Brecht L.E. et al. Microvascular reconstruction of the pediatric mandible // Plast. Reconstr. Surg. 2007. Vol. 119. No. 2. P. 649–661. DOI: 10.1097/01.prs.0000246482.36624.bd
13. Bolotin M.V., Lopatin A.V. Microvascular reconstruction of defects of the mandible in children // Opukholigolovyishei. 2013. Vol. 2. P. 16–19. DOI: 10.17650/2222-1468-2013-0-3-16-19
14. 14. Guo L., Ferraro N.F., Padwa B.L. et al. Vascularized fibular graft for pediatric mandibular reconstruction // Plast. Reconstr. Surg. 2008. Vol. 121. No. 6. P. 2095–2105. DOI: 10.1097/PRS.0b013e3181712399
15. Никитин Д.А., Миргазизов М.З., Никитин А.А. Лечение и реабилитация больных после костно-реконструктивных и восстановительных операций на нижней челюсти с использованием эндопротезирования и дентальных имплантатов // Альманах клинической медицины. 2011. № 24. С. 15–21.
16. Марков Н.М., Грачев Н.С., Бабаскина Н.В. и др. Стоматологическая реабилитация в комплексном лечении детей и подростков с новообразованиями челюстно-лицевой области // Стоматология. 2020. Т. 99. № 6. Вып. 2. С. 44–62. DOI: 10.17116/stomat20209906244

AUTHOR INFORMATION

*** Mikhail G. Semyonov**, MD, PhD, D.Sc., Professor;
address: 64-68 Parkovaya str., Pushkin,
Saint Petersburg, 196603, Russia;
ORCID: https://orcid.org/0000-0002-0803-1923;
eLibrary SPIN: 2603-1085; e-mail: sem_mikhail@mail.ru

ОБ АВТОРАХ

*** Михаил Георгиевич Семенов**, д-р мед. наук, профессор;
адрес: Россия, 196603, Санкт-Петербург,
Пушкин, ул. Парковая, д. 64–68;
ORCID: https://orcid.org/0000-0002-0803-1923;
eLibrary SPIN: 2603-1085; e-mail: sem_mikhail@mail.ru

* Corresponding author / Автор, ответственный за переписку

AUTHOR INFORMATION

Sergei I. Golyana, MD, PhD,
ORCID: https://orcid.org/0000-0003-1319-8979;
eLibrary SPIN: 8360-8078; e-mail: ser.golyana@yandex.ru

Vasily V. Mikhailov, MD, PhD;
ORCID: https://orcid.org/0000-0002-8593-2039;
eLibrary SPIN: 6036-2234; e-mail: vm911@mail.ru

Konstantin A. Afonichev, MD, PhD, D.Sc.;
ORCID: https://orcid.org/0000-0002-6460-2567;
eLibrary SPIN: 5965-6506; e-mail: afonichev@list.ru

Olga V. Filippova, MD, PhD, D.Sc.;
ORCID: https://orcid.org/0000-0002-1002-0959;
eLibrary SPIN: 8055-4840; e-mail: olgail@mail.ru

Yulia V. Stepanova, MD, PhD;
ORCID: https://orcid.org/0000-0003-3968-5206;
eLibrary SPIN: 8606-0381; e-mail: turner8ord@gmail.com

ОБ АВТОРАХ

Сергей Иванович Голяна, канд. мед. наук;
ORCID: https://orcid.org/0000-0003-1319-8979;
eLibrary SPIN: 8360-8078; e-mail: ser.golyana@yandex.ru

Василий Владимирович Михайлов, канд. мед. наук;
ORCID: https://orcid.org/0000-0002-8593-2039;
eLibrary SPIN: 6036-2234; e-mail: vm911@mail.ru

Константин Александрович Афоничев, д-р. мед. наук;
ORCID: https://orcid.org/0000-0002-6460-2567;
eLibrary SPIN: 5965-6506; e-mail: afonichev@list.ru

Ольга Васильевна Филиппова, д-р. мед. наук;
ORCID: https://orcid.org/0000-0002-1002-0959;
eLibrary SPIN: 8055-4840; e-mail: olgail@mail.ru

Юлия Владимировна Степанова, канд. мед. наук;
ORCID: https://orcid.org/0000-0003-3968-5206;
eLibrary SPIN: 8606-0381; e-mail: turner8ord@gmail.com