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RECONSTRUCTION OF THE MANDIBLE WITH VASCULARIZED ILIAC CREST FLAP - INITIAL EXPERIENCE AT THE TATA MEMORIAL HOSPITAL

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SUMMARY

Resection of the mandible for cancer of the oral cavity can result in gross functional and aesthetic deformity. Inspite of technological advances, reconstruction of mandibular defects remains one of the most challenging procedures in head and neck surgery. Conventional methods like alloplastic implants and bone grafting have a high rate of failure. The advent of microvascular techniques for mandibular reconstruction has revolutionised the management of these patients. We present our initial experience based on 18 patients who underwent vascularised iliac crest transfer at the Tata Memorial Hospital between November, 1992 and January, 1994. The operative technique of raising, shaping and fixation of the iliac crest flap as well as advantages and disadvantages are discussed. Postoperative graft viability was assessed using ^{99m}Tc-MDP scans during the 1st, 3rd and 12th weeks after surgery. We lost 3 flaps (16.4%) due to uncontrolled infection and vessel thrombosis. All of the remaining patients demonstrated good uptake on bone scans and satisfactory bony union on OPG. We conclude that mandibular reconstruction using the vascularised iliac crest is reliable and produces acceptable postoperative functional results with 88% of patients having no swallowing difficulty, 83% with normal speech and excellent cosmesis in 83% (15/18) of the patients.

ZUSAMMENFASSUNG

Rekonstruktion des Unterkiefers mit einem vaskularisierten Lappen aus der Crista iliaca - die ersten Erfahrungen im Tata Memorial Krankenhaus

D. N. Savant, S. G. Patel, T. Verghese, H. M. Bhathena, N. M. Kavarana

Die Resektion des Unterkiefers wegen Krebs kann zu starken funktionellen und ästhetischen Deformitäten führen. Trotz der technologischen Fortschritte, bleibt die Rekonstruktion der Defekte des Unterkiefers ein höchst anspruchvolles Verfahren auf dem Gebiet der Kopf- und Halschirurgie. Konventionelle Methoden, wie alloplastiche Implantate und Implantation von Knochenstückchen haben eine hohe Rate von ungünstigen Ergebnissen. Die Einführung von mikrovaskulären Techniken in die Rekonstruktion des Unterkiefers bedeuteten eine Revolution in der Behandlung dieser Patienten. Die Autoren berichten über ihre ersten Erfahrung mit der Behandlung von 18 Patienten nach der Übertragung einer vaskularisierten Crista ilica die im Memorial Hospital in Tara zwischen November 1992 und Januar 1994 erfolgten. Die chirurgische Technik der Exzision, Gestaltung und Fixation der implantierten Crista ilica sowohl wie ihre Vorteile und Nachteile werden erörtert. Die 99mTc-MDP Szintigraphie diente zur postoperativen Wertung der Lebensfähigkeit des Implantates während der ersten, dritten und 12-ten Woche nach der Operations. Es wurde 3 Lappen verloren (16,4%) wegen unkontrollierter Infektion und Gefässthrombose. Bei den anderen Patienten zeigte die Szintigraphie der Knochen ein gutes Anheilen und das OPG ein gutes Zusammenwachsen der Knochen. Die zeigte, dass die Rekonstruktion des Unterkiefers mit der vaskularisierten Crista ilica als verlässlich bezeichnet werden kann und mit guten postoperativen Ergebnissen. Bei 88% der Kranken bestanden keine Schluckbeschverden, 83% hatten ein normales Sprachvermögen und 83% ausgezeichnete kosmetische Ergebnisse (15/18).

Key words: mouth neoplasms, mandible, plastic surgery

Resection of the mandible for cancer of the oral cavity can result in gross functional and aesthetic deformity. In spite of technological advances, reconstruction of mandibular defects remains one of the most challenging procedures in head and neck surgery. Conventional methods like alloplastic implants and bone grafting have a high rate of failure. The introduction of microvascular techniques for mandibular reconstruction has revolutionised the management of these patients and we present our initial experience with this technique at the Tata Memorial Hospital.

PATIENTS AND METHODS

Between November 1992 and January 1994, 18 patients underwent microvascular iliac crest transfer for mandibular reconstruction after resection for oral cavity cancer at the Tata Memorial Hospital. The patients ranged in age from 26 to 50 years, and there were 14 males and 4 females.

None of our patients had received preoperative radiation therapy or chemotherapy. Expect for one patient with fibrosarcoma of the lower alveolus, all other had squamous cell carcinoma, 12 arising from the lower alveolus and 5 from the buccal mucosa. All 17 patients with squamous carcinoma were staged T4; 8 of these had a clinically positive neck (N1). Ten patients had a post-excision defect involving both bone and mucosa, while 8 had only a bone defect. Bone defects were classified after Urken et al. (9) and ranged in length from 6 cms. to 10 cms. (mean 7.5 cms.). Mucosal defects ranged from zero to 30 cm^2.

The technique for dissecting the deep circumflex iliac artery (DCIA) iliac crest flap has been described by Taylor et al (8). Harvesting time for the DCIA flap ranged from 50 to 90 min. (mean 64.4 min.). After preparation of the recipient vessels and bone the DCIA flap was disconnected and the bone and soft tissue were appropriately positioned (Fig. 1).

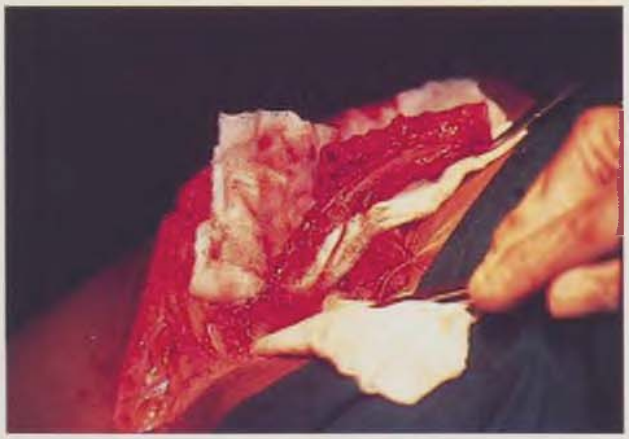

Fig. 1: DCIA flap raised showing its vascular pedicle and the nutrient vessels running in the groove.

Microvascular anastomoses were then carried out, arterial anastomosis (mean time 13.5 min.) preceded by the venous anastomosis (mean time 13.5 min.). Dimensions of the vessels are given in Table 1. The ischemia time ranged from 55 to 90 min. (mean 66.6 min.) and total reconstruction time ranged from 150 to 270 min. (mean 201.6 min.). The mucosal defect required no reconstruction in 13 patients and a skin paddle overlying the iliac crest graft was used in 2 patients. The muscles attached to the iliac crest graft were used as a myofascial flap to line the mucosa in 2 patients, while in one patient, two microvascular flaps were used simultaneously: DCIA iliac crest for bone and a groin flap for mucosal reconstruction.

Table 1: Dimensions of vessels

	Range	Average
Venous anastomosis		
Donor vein caliber (Deep circumflex iliac)	2.2-2.8 mm	2.4 mm
Recipient vein caliber		
Linguofacial (n=9)	2.1-2.7 mm	2.3 mm
Facial (n=8)	2.2-2.8 mm	2.4 mm
Internal jugular (n=1)		2.8 mm
Arterial anastomosis		
Donor artery caliber (Deep circumflex iliac)	2.2-2.5 mm	2.4 mm
Recipient artery caliber (Facial)	2.4-2.5 mm	2.4 mm
Length of pedicle	5-7 cm	6 cm

Fixation of the overlapped bone graft was done using stainless steel wire no. 26 and rigid fixation was not employed in any of our patients. The wound was drained using two low-suction drains and was closed in the conventional manner. Patients were routinely prescribed postoperative intravenous low-molecular weight dextran for 3 days, pentoxyfylline for 7 days and low-dose aspirin for 21 days.

Graft viability was assessed using 99mTc-MDP bone scans during the 1st week, 3rd week and the 3rd month after surgery. Patients were evaluated postoperatively for functional and cosmetic results.

RESULTS

Hospital stay ranged from 7 to 21 days (mean 13.4 days) and there were no hospital deaths. Three bone grafts were lost due to severe, uncontrolled infection, and these patients also developed an orocutaneous fistula which healed after protracted conservative management and extraction of the unviable graft. One patient had a partial loss of the groin flap used for intraoral lining.

Bone scans during first postoperative week showed a viable graft in 15 patients, doubtful viability in 1 and no uptake in 2 patients. Repeated scans during the 3rd postoperative week confirmed an absence of uptake in 3 patients and all of these grafts had to be extracted. We have a minimum follow-up of 12 months and all 15 patients with viable grafts have radiologically demonstrated bony union.

Although there was no demonstrable donor side morbidity (hernia or abdominal wall weakness), one patient did develop postoperative donor site wound infection which resolved with conservative management.

Fig. 2a: Preoperative (It) lateral view of patient A.

Fig. 2b: Postoperative (It) lateral view.

Fig. 2c: Postoperative frontal view.

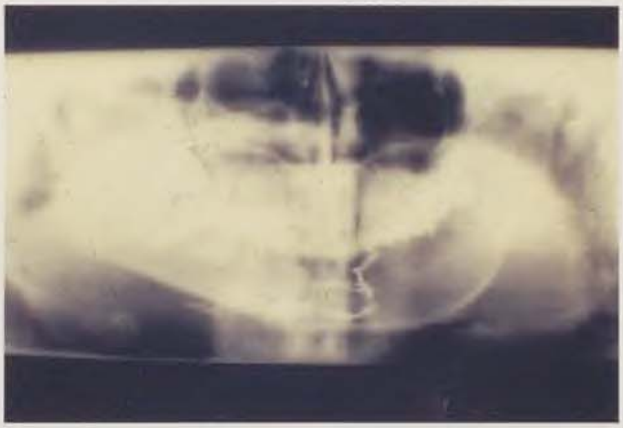

Fig. 2d: Postoperative orthopantomogram.

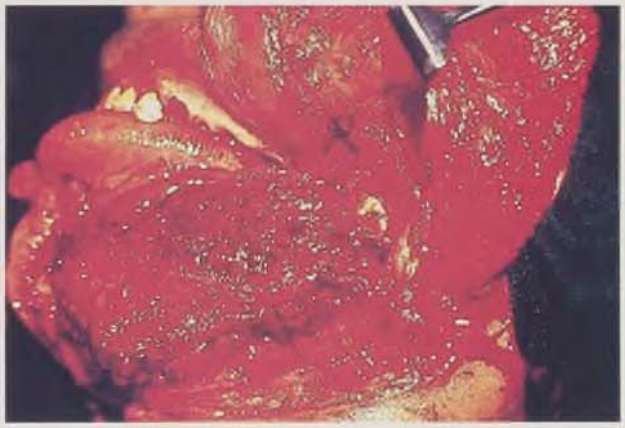

Fig. 3a: Patient B.Intraoperative view showing flap insetted.

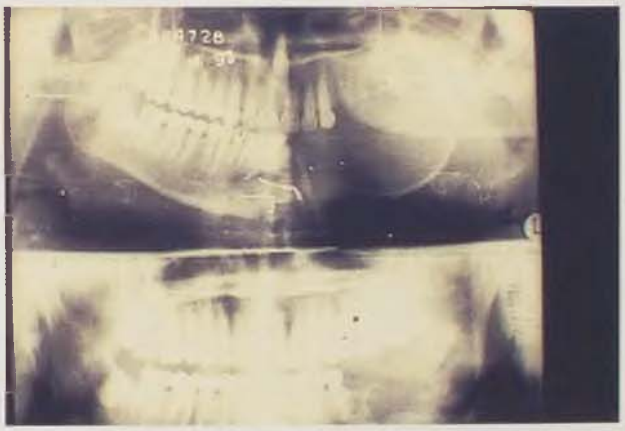

Fig. 3b: Pre and postoperative orthopantomograms.

Fig. 4a: Preoperative view of patient C previously operated for a segmental mandibulectomy for a Ca Rt buccal mucosa with no mandibular replacement.

Fig. 4b: Postoperative front view - 3 months after the operation.

Fig. 4c: Postoperative bone scan on PO day 5.

Patients were assessed functionally and 16/18 (88%) had no swallowing problems with 15/18 having a normal speech. Cosmetically all 15 patients with intact bone had excellent results (Figs. 2a, 2b, 2c, 2d, 3a, 3b, 4a, 4b, 4c). The patients with the groin flap loss underwent an SSG for the vestibule at a later stage with no deformity of the external contour.

DISCUSSION

The necessity for immediate restoration of contour and function after resection of the mandible for oral cancer has led to utilization of numerous techniques of bone grafting and alloplastic implantation. These methods of reconstruction have had a high failure rate, especially when used for immediate reconstruction in irradiated patients.

Ostrup and Fredrickson (6) reported the successful microvascular transfer of rib grafts to replace segments of irradiated mandibles in dogs. This report opened the floodgates and over the ensuing couple of decades, various microvascular techniques were described with remarkable success rates. The rib graft was one of the first to be used in clinical practice, and this was followed by Ariyan's description of the osteomusculocutaneous intercostal graft. Subsequent developments included the latissimus serratus transfer, the composite dorsalis pedis with metatarsal graft, the radial osteocutaneous flap, and the scapula osteocutaneous flap (2).

Daniel (3) reported a groin flap which included the iliac crest based on the superficial circumflex iliac vessels. The main drawbacks of this flap were the small vessels and short pedicle. Taylor et al. (8) described the use of iliac bone based on the deep circumflex iliac artery (DCIA) to reconstruct a hemimandible and Hidalgo (5) reported the free fibular flap for mandibular reconstruction in 1989.

At the Tata Memorial Hospital most patients have been managed using a pectoralis major osteomyocutaneous flap (7), cadaveric iliac crest or Silastic(R) implants. While cosmesis with these techniques has been acceptable, a small number of patients have been rehabilitated optimally. We have had a flap success rate of 83.6% with the use of the iliac crest osteo and osteocutaneous flaps and with increasing experience it was realised that results with free flaps in properly selected cases are superior to those with previous methods. Fixation of the graft was successfully accomplished using no. 26 stainless steel wires. Our experience is borne out by that of Brian Boyd and Mulholland (1) who analysed fixation techniques in 140 vascularized grafts and concluded that vascularised bone grafts exhibit a high degree of bony union and that fixation technique - rigid versus nonrigid - appears unimportant.

We prefer the DCIA iliac crest flap for mandibular reconstruction because of its numerous desirable features: abundant bone, a long vascular pedicle, the course of the vessels along the rim of the inner table of the iliac crest and a thick periosteum which allow contouring of the bone, availability of overlying groin skin for external surfacing or inner lining, and discreet donor site.

None of the patients required any osteotomies for contouring as the bone cuts were as per the defect contour and miniplates were not used. The fibula requires multiple osteotomies with fixation which increases the operative time and thus is less optimal than the iliac crest which is also a better bone for prosthodontic implants. The radial osteocutaneous flap uses only a sliver of the radius and the donor defect has a tendency to fracture pathologically. The scapular osteocutaneous flap requires a change in positioning the patient while harvesting and insetting and hence is quite cumbersome. The only disadvantage lies in the fact that the deep circumflex iliac vessels have a relatively small calibre as compared to the fibular vessels and require a meticulous anastomosis. The flap failure rate in the present series is 16.4%. David et al. (4) reported a flap failure rate of 15%, and though 25% of their patients could wear dentures, none of them could chew effectively. Though most of our patients have regained acceptable mastication, mainly because of intact dentition on the unaffected mandible, optimal functional rehabilitation is still a distant goal.

CONCLUSIONS

Mandibular reconstruction using vascularised iliac crest is reliable and produces cosmetically acceptable results. However, optimal functional rehabilitation of these patients will have to await the development of techniques of osseointegrated implantation at our institute.

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THE INDICATIONS AND THE PLAN OF PLASTIC OPERATIONS IN CHILDREN WITH DOWN'S SYNDROME

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SUMMARY

During the past ten years (1984-1993), 52 children with Down's syndrome aged 3-16 years were treated surgically at the Department of Plastic Surgery at the Medical University of Lódz. The authors present the indications and the treatment plan in selected patients, the optimal timing of surgical treatment, the choice of surgical methods for the correction of facial deformity and for the limpness of tongue depending on its form and intensity.

Elimination of mongoloid features of the face (tongue, lower lip, eyelids, nose) has a positive influence on rehabilitation of children with Down's syndrome. This procedure was used in Poland for the first time.

ZUSAMMENFASSUNG

Indikationen und Plannung der plastischen Operationen bei Kindern mit dem Down-schen Syndrom

E. Lewandowicz, J. Kruk-Jeromin

Während der letzten 10 Jahre (1984-1993) wurde 52 Kindern mit dem Down-schen Syndrom chirurgisch behandelt an der Abteilung für Plastische Chirurgie, der Medizinischen Universität in Lódz. Die Autoren erörtern die Indikationen und die Plannung der Behandlung in ausgewählten Patienten, den optimalen Zeitpunkt der chirurgischen Behandiung, die Wahl der chirurgischen Methode zu der Korrektion der Gesichtsdeformitäten, und einer schlaffen Zunge, je nach ihrer Form und Intensität. Die Beseitigung der mongoloiden Merkmale des Gesichtes (Zunge, Unterlippe, Augenlider, Nase) hatte positive Wirkungen auf die Rehabilitation der Kinder mit dem Down-schen Syndrom. Es handelt sich um die erste Anwendung dieser therapeutischen Methode in Polen.

Key words: Down's syndrome, plastic surgery, indications

Patients with Down's syndrome (DS) present characteristic mental and physical stigmata conditioned by quantitative chromosomal aberration of the G group in the form of trisomy of one chromosome or translocation of chromosomal material into the G or D group. The incidence of Down's syndrome amounted to approximately one out of 800 live births. The risk of giving birth to a DS child increases with maternal age and is as high as one in 100 after the age of 35 and one in 50 after the age of 45 years. Down's syndrome in children is characterized by specific facial changes, abnormal body proportions, hypotonia, joint flaccidity, a transverse palmar flexion crease and a plantar furrow. Other congenital anomalies like mental retardation and decreased resistance to respiratory infections often accompany the syndrome. Before the introduction of antibiotics DS individuals rarely survived up to the age of 18 years. They usually died from recurrent pneumonia (3, 15). Physical appearance is of great importance in our society. Though external features are an individual phenomenon people with characteristic stigmata, beyond the generally accepted norm, are always rejected by the community. DS children have a flat face, slanting palpebral fissures, epicanthal folds, a low nose bridge, a stretched and floppy lower lip and an enlarged tongue protruding from open mouth. A strange appearance of the child's face is intensified by prominent and deformed auricles. Mental development of these children progresses slowly reaching to different levels (15). On account of considerable numbers of children born with Down's syndrome and their prolonged survival rate the necessity of comprehensive developmental programme for them and their parents has arisen. It appeared that a greater proportion of these children can achieve mental development that allows them to attend not only special but even normal schools as well. In their adult life they are able to find some forms of employment and function as independent individuals. In such cases the children require a therapeutic programme including the help of psycholo-

gists, speech therapists and a greater care and involvement of their parents and tutors. Different and mongoloid features of the DS persons form a barrier to social acceptance. The change of facial features and the improvement of speech appear to be very helpful to them. Positive results of reconstructive surgery performed by many authors who dealt with large groups of patients have encouraged us to undertake surgical procedures in children with the DS syndrome (5, 6, 8-14, 15) (Fig. 1).

Fig. 1: The schema of various plastic operations masking mongoloid facial physiognomy.

The aim of our study was to help the DS children i.e. to determine the indications and the method of surgical treatment, to determine the optimal timing for treatment initiation and performance of various plastic operations of the face and to 2choose the surgical methods for the correction of the facial deformities according to their form and intensity.

MATERIAL AND METHOD

In 1984 the Department of Plastic Surgery in the Institute of Surgery at the Medical University of Lódz established a cooperation with the Department of Medical Genetics in the Institute of Endocrinology at the same University. The children with Down's syndrome referred to our Clinic had the diagnosis confirmed by the karyotype examination and belonged to the group of patients with the higher potential for mental development (7, 8). For 10 years we have treated 52 DS children ranging in age from 3 to 16 years in whom we have performed 91 surgical procedures "masking" mongoloid facial features and improving the functions of speech and sight. We have carried out the following operations: partial glossectomy (39 patients), lower lip reduction (6 patients), epicanthoplasty (18 patients), lateral canthoplasty (11 patients), augmentation of the saddle-shaped nose (6 patients), otoplasty (9 patients) and cleft lip and palate surgery (1 patient). Partial resection of the hypertonic tongue and of the lower lip, apart from aesthetic aspects, was to improve spe-

2a)

2b)

Fig. 2 a, b: A boy with Down's syndrome (a), after partial resection of the hypertonic tongue and epicanthoplasty (b).

3a)

3b)

Fig. 3 a, b: A young man with Down's syndrome (a), after partial glossectomy and lower lip resection (b).

4a)

4b)

Fig. 4 a, b: A female - child with Down's syndrome (a), after partial resection of the tongue, epicanthoplasty and lateral canthoplasty (b).

5a)

5b)

Fig. 5 a, b: A baby - girl with Down's syndrome (a), after partial glossectomy and an allograft of the cartilage on the nose bridge (b).

ech, allow the closure of the mouth, eliminate drooling and skin inflammation on the chin as well as to prevent malocclusion and respiratory infections. Epicanthoplasty improved their appearance, widened the visual area and eliminated sham strabismus. In order to correct the faces of the DS individuals we have adjusted the methods used in reconstructive surgery of various congenital malformations, the sequelae of a disease, and posttraumatic facial deformations. Our long-term experience in the treatment of other defects and congenital malformations proved to be very useful at the Centre for Congenital Deformities. The age of the operated children depended upon their age on registration to our Centre, on their mental development and general health conditions. In our opinion the optimal timing for the surgery of the tongue and lower lip reduction is the age of 3-4 years, for epicanthoplasty and lateral canthoplasty - the age of 4-5 years, and for the correction of the saddle nose and otoplasty - the age of over 5 years. Deviations between the age of the operated children and the age determined as optimal were very small. Indication for surgical treatment in DS children are relative so the risk of the therapy should be limited to minimum. A very precise estimation of the child's general health is of great importance. We have made efforts to shorten the time of in-patient treatment in these little patients since there is nothing more soothing for a child as the parents' care. The surgical procedures usually required 1 to 3 days' stay in hospital. All the operations were performed under general anesthesia in order to reduce the patients' pain and fear. Antibiotics of the penicillin group were most often administered to the children after the surgery. No postoperative complications were observed in any of our patients (Figs. 2-5).

RESULTS

The patients were examined after 14 days, 2 months, and the every 6 months following the operation. The shortest follow-up observation was 6 months, the longest was 10 years. During the check-up examinations we checked if the child kept the mouth closed throughout the day and at night, if it could breath thrugh the nose, if no inflammatory changes were present on the skin of the lower lip and chin, if respiratory infections occurred more rarely, if there was an improvement in eating habits and speech and if the change of the facial physiognomy had a positive influence on the community acceptance of the child.

All parents felt satisfied with the improved facial configuration and speech of their children. Eating behaviour was considerably improved and a decrease of the prevalence of respiratory infections was observed. The change of facial features resulted in a better social adjustment of DS children.

The evaluation of all parameters of surgical treatment of DS children disclosed that plastic surgery improved the patients' appearance providing them with more comfortable life and facilitating their further rehabilitation.

DISCUSSION

The surgical treatment of facial malformations in patients with Down's syndrome was initiated more than 20 years ago. The first attempts of surgical correction of these malformations were already made in the 60s (6, 9-11). The first case history of the 15 years aged girl with DS, who underwent surgery at pre-school age was published in 1977 (4). At the age of 5 years the correction of a saddle nose and receding chin was performed using

silicone implants. The operations masking mongoloid facial physiognomy resulted in a better mental development of the girl and her social adaptation.

Several papers were published during the last ten years in which surgeons and psychologists presented their experience with surgical treatment, rehabilitation of the DS subjects and evaluation of aesthetic and functional outcome of facial plastic surgery (1, 2, 5-7, 10, 13, 16).

The first larger study on plastic surgery in DS patients was carried out at the Department of Plastic Surgery in Frankfurt where 67 patients ranging in age between 2-22 years were treated in 1977-1980 (6). The authors pointed out that the parents of the operated children were very pleased with their improvement in appearance, and that the older children were aware of the beneficial changes following facial plastic surgery. In 1980-1985 Olbrisch (9-11) published several papers in which the author presented satisfactory results of surgical procedures used in 250 children with Down's syndrome. In the 80s studies from Jerusalem reported data on 50 DS patients who were subjected to plastic surgery in order to mask their mongoloid stigmata (16). The surgical procedures influenced positively the patients' life because the improvement in appearance inclined their parents to more intensive rehabilitation and promoted their integration into the community. In 1983 Rozner demonstrated the results of the facial plastic surgery in a few children with Down's syndrome (13). The author did not notice an evident influence of surgical therapy upon greater chances for success in the patients' life. Apart from the unquestionable positive evaluation of the aesthetic outcome of plastic operations some phoniatricians are doubtful about the beneficial impact of partial glossectomy on articulation. Positive estimations of the long-term functional results of tongue operations made by Olbrisch and Wexler in larger groups of patients seem to be more convincing (10, 16). The surgeons are not the only specialists who assess the effects of facial and tongue plastic surgery upon the psychical rehabilitation of DS children. Several pediatricians and psychologists published the results of their investigations on the same subject (5). Despite the lack of specific tests devised for patients with DS most authors emphasize the positive influence of plastic operations on the future life of these subjects. Their opinions are in agreement with our observations. The Department of Plastic Surgery in Lódz is the first and the only centre in Poland in which the complex treatment of facial malformations in DS children has been undertaken. The therapeutic plan and the timing of the individual operations presented by us on the basis of our experience seems to be optimal.

CONCLUSIONS

1. Each DS child with some perspectives for cognitive and social functioning should be entitled to the complex treatment including a cooperation of experienced specialists including geneticists, pediatricians, speech therapists and plastic surgeons.

2. Surgical treatment of facial malformations in DS children with perspectives for future independent life should be initiated at pre-school age.

3. Reduction of the overgrown tongue and the flabby lower lip exerts the greatest impact on the facial physiognomy and rehabilitation of DS children. These surgical procedures should be performed at the beginning of the treatment but after the age of 3 years.

4. Correction of epicanthal folds can be made after the age of 4 years. In case of very large epicanthal folds limiting the patient's field of vision it can be performed earlier.

5. Heightening of the nose bridge and otoplasty should be undertaken following the time of the most intensive growth in these regions i.e. after the age of 5 years.

6. Improvement of speech and physiognomy of DS patients following plastic surgery encourages the family to a more intense care and promotes community acceptance which is of great importance for the childrens' further development.

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POSSIBLE COMPLICATIONS OF SAGITTAL OSTEOTOMY OF THE MANDIBULAR RAMUS

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SUMMARY

A report on the possible occurrence of a complication of sagittal eosteotomy of the mandibular ramus and the description of the development of a dissecting aneurysm within the supply of the right maxillary artery.

ZUSAMMENFASSUNG

Eine mögliche Komplikation der sagittalen Osteotomie des Astes des Unterkiefers

T. Neméth

Ein Bericht über eine mögliche Komplikation der sagittalen Osteotomie des Unterkieferastes, einschliesslich der Kasuistik der Entstehung eines Aneurysma dissecans im Versorgungsgebiet der rechten maxillaren Arterie.

Key words: sagittal osteotomy, peroperative complications, mandibular prognathia

At the Department of Maxillofacial Surgery of the Central Military Hospital in Prague a surgical repair of jaw anomalies has been performed for more than 35 years. The experience of the occurrence of complications is based on more then 2 400 performed surgical procedures.

Since 1967 a sagittal osteotomy of the mandibular ramus according to Obwegeser and DalPonte has been carried out in case with a positive indication. These surgical procedures were performed in over 1 000 cases.

During 26 years of experience with this procedure more or less 400 serious complications were observed a brief account of which follows. The presented case report is an example of a very rare complication.

Peroperative complications.

An inapropriately located incision of soft tissues complicates the last stage of the operation - the suture. The hooks can cause an inadequate contusion of soft tissues. The hook can be also broken and in particular within the retromandibular region the removal of the broken-off part of the hook is associated with great difficulties.The drill can also crack during sagittal osteotomy and if the posterior edge of the ramus is insufficiently protected,the chisel can penetrate the skin cover, it is also possible to damage the local veins or the branches of the a. maxillaris, a. facialis or of a nerve bundle leading to a complication in the form of bleeding and postoperative anaesthesia.

Sometimes a superfluous shifting of the periost within a small segment with its subsequent inadequate adjustement is performed. It consists mainly of an adequate reduction both in ventral direction and of its outer ridge. This should prevent the penetration of the outer osseous ridge through the mucosa into the oral cavity.

An unfinished osteotomy interferes with the reposition of a mandibular segment into the planned position. A forced manipulation, e.g. with a chisel, can lead to a fracture of the bone at an unfavourable site which does not facilitate the termination of the surgical procedure. An insufficient cooling of a rotating tool results in the development of osseous necrosis.

Sometimes it is necessary to extract peroperatively retined wisdom teeth. It is always mandatory to remove the pericoronary sac. The roots of the lower molars should never be damaged during an osteotomy in this region.

The postoperative complications include e.g. the disintergration of the suture, and in the case of insufficient drainage the development of an excessively large hematoma, infection and a reccurence. Complications are also promoted by an inadequate fixation of fragments.

The above mentioned complications can be prevented by a skillful surgical technique, by the preservation of the posterior branch of the ramus, by a good overview of the operated field, an adequate cooling of drillers, the repair of the small

segment and its correct fixation. Antibiotics are applied in all cases, they are most convenient as a prophylactic measure.

CASE REPORT

We would like to describe an uncommon complication. During an exposure of the bone the section of the mandibular ramus on the right side was followed by an intense bleeding from the region behind the posterior margin of the ramus. Hemostasis was attained by an insertion of gelaspon behind the posterior margin of the ramus and a compression. The operation was terminated by an osteotomy of the ramus, on the left, and a firm fixation between both jaws, followed by a suture of the surgical wounds. The immediate postoperative course was without complications. After four weeks a sweelling in the region of the condylar process of the mandible on the right side was detected, which continued to increase and was suggestive of a development of an arterial aneurysm resulting from the peroperative injury of the artery.

An arteriography of the right external carotid artery and of the maxillary artery via the femoral artery was performed after the removal of the intergnathic fixation. Arteriography revealed at the level of the parotis a sacculated aneurysm of the maxillary artery filling of the size 20x35 mm. The ventrolateral contour of the aneurysm was effaced, most probably because of a thrombosis on the wall of the artery.

After the diagnosis it was decided to treat the aneurysm by embolization. The treatment was performed in general anaesthesia through a catheter introduced selectively into the right maxillary artery. This artery and its branches inclusive of the aneurysm were gradually occluded with injected gelaspon emboli. After the termination of embolization the maxillary artery was filled only within 1 cm. The procedure was well tolerated by the patient and after a few days it was possible to record a decrease of the swelling which previously measured 4x3x1 cm. After embolization the patient sensed for several days a tension within the region of the parotis during the consumption of spiced food. Three months after embolization the patient was free of any complaints, the swelling disappeared and the opening of his mouth was normal.

DISCUSSION

During more than one thousand osteotomies performed at our department we did not encounter any complications, which would reduce the beneficial effects of surgery or even threaten the life of the patient, or require repeated surgery. Occasionally it was necessary to evacuate a haematoma, in about six cases a purulent exudation occurred which was controlled by the application of antibiotics and an evacuation of pus. Only at three patients appeared recurrences and they were due to the surgical technique which was not skillful at beginning of the development of this surgical method.

In the above described case report was presented an injury of the wall of the maxillary artery with a chisel during an insufficient protection of the posterior margin of the madibular ramus with a bent hook. If an arterial aneurysm develops, its surgical excision or an embolization should be considered either its surgical excision or an embolization. In the reported case it developed in a region in which surgery is associated with great difficulties and therefore it was decided to use the technique of selective embolization. This method yielded very satisfactory cosmetic results.

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OUR LONG-TERM EXPERIENCE AND RESULTS OF SURGICAL MANAGEMENT OF THE CARPAL TUNEL SYNDROME

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SUMMARY

On the basis of 2 867 surgical revisions in individuals with the diagnosis of the Carpal Tunel Syndrome performed in 1975-1994 were determined principles for the indication of surgical treatment and the choice of surgical technique and postoperative care. Underlined was the surgical method of n. medianus revision within the palm in the aim to prevent the development of a painful scar due to the injury of the ramus palmaris nervi mediani. Finaly was mentioned the beneficial effect of soft laser on the scar exerted during the postoperative period.

ZUSAMMENFASSUNG

Unsere langjährigen Erfahrungen und Ergebnisse der chirurgischen Behandlung beim Karpal-Tunel Syndrom

V. Dlabalová

Anhand von 2 867 chirurgischen Revisionen bei der Diagnose deS Karpal-Tunel Syndroms in den Jahren 1975-1994 erfolgte die Bestimmung der Prinzipen der Diagnosestellung zur chirurgischen Behandlung, der Wahl des chirurgischen Verfahrens und der postoperativen Behandlung. Unterstrichen wurde die chirurgische Methode der Revision des N. mediani der Handfläche mit dem Ziel der Verhütung einer schmerzenden Narbe infolge der Schädigung des Ramus palmaris N. mediani. Es wurde die Möglichkeit einer günstigen Beeinflussung der Narbe mit weichem Laser erwühnt.

Key words: Carpal Tunel Syndrome, surgical treatment of ramus palmaris n. mediani

In the Table 1 are presented the numbers of performed surgical median decompressions in the years 1975-1994. They illustrate the increasing numbers of surgical procedures in individuals with this diagnosis which is a fact providing reasons for some considerations.

In our opinion the increasing frequency of this syndrome is due to improved diagnostic methods and to the increasing confidence that surgery provides beneficial effects. Females born in years with a high birth rate, attain an age associated with a high risk of the disease and who in addition with house work had jobs requiring the force which is usual in hard work of men. However, there was also an increasing number of males with this diagnosis treated surgically within the last five years.

If the surgeon sees his patients only at the operating theater and then during the removal of stitches he can gain the impression that there are no doubts about satisfactory results. However a long-term follow-up of these patients provides him with the opportunity to realize the occurrence of numerous problems.

During the above mentioned period of years the nerve was exposed by an excision leading from the bottom of the palm along the midline of the wrist about 4 cm above its volar flexion crease in the form of V or Z. During the postoperative check-up examination 27% of patients had subjective complaints consisting of pain in the proximal part of the scar. They were due to a compression by the scar or to a disconnection of the ramus palmaris nervi mediani. At the same time there were a relief of night pain and an improvement of the sensitivity and of the fine motoric function. However persisting complaints in the region of the scar produced discomfort in some of these patients and resulted in a reduced working ability.

This induced us to make a shorter incision and since the second half of 1994 it did not exceed beyond the volar flexion crease. Thus the incision forms a slight arch around the thenar in ulnar direction. The proximal part of the retinaculum is sectioned during a simultaneous protection of the n. medianus without cutting the skin and the subcutis overlaying the nerve.

Table 1. Numbers of surgical procedures performed in individual years.

1975	76	77	78	79	80	81	82	83	84
1	6	2	5	6	14	16	34	36	42
1985	86	87	88	89	90	91	92	93	94
86	156	223	256	245	182	252	343	542	640

The assessment of this procedure was suggestive of beneficial results, but the short time which elapsed since the introduction of this technique did not allow to draw any definite conclusions. We continue with a meticulous follow-up of these patients.

In 2/3 of individuals with a loss of the opposition function of the thumb (in 16% of our series) simultaneously with the decompression of the nerve was applied mostly our own surgical method of dynamic opposition based on the use of the long flexor of the thumb. In the remaining patients the above described condition caused no discomfort, or they included individuals in higher age groups and patients who did not co-operate. However in a certain proportion of the patients the relief after the surgical procedure lasted only for a limited period of time, or there was no improvement of subjective complaints and some reported even a deterioration. Efforts are made to attain an improvement by the administration of vitamine B 12, 1 000 Gamma, cocarboxylasis and ATP.

Local treatment includes the application of soft laser, or of magnetic therapy. In the case of a failure a repeated EMG study and consultations can lead to a reoperation. EMG studies are not always in agreement with subjective complaints, however the latter have the priority during our final decisions. We are well aware of a possible deterioration of symptoms which might occur in some cases.

The number of patients operated for median nerve compression represents 21% of all surgical procedures. Therefore efforts are made to attain in this commonly performed and often somewhat bagatellized operation further improvement which would lead to an optimum efficiency of this surgical technique.

We would like to confirm the well-know experience of a lower efficiency in patients with an associated vasoneurosis which represent a more complex involvement which cannot be satisfactorily cured by decompression.

CONCLUSIONS

On the basis of twenty year experience in hundreds patients we consider of major importance:

1. A thoughtful determination of indications for surgical treatment.

2. A co-operation with a neurologist in determination of indications for surgery and in the postoperative follow-up inclusive of EMG studies.

3. A refined surgical technique based on a good knowledge of the topography of the wrist and of possible anatomic deviations.

4. Prevention of oedema as a prerequisite of smooth healing resulting in the development of a fine scar.

5. A postoperative rest regimen for 2-3 months.

6. A supporting medication of vit. B 12, the treatment of a stiff scar with laser.

In some departments persists the tendency to understimate this surgical procedure, however, the sequelae of some of these procedures which were not performed lege artis prove to irreversible and are accompanied by marked complaints.

Table 2. Composition of the surgically treated patients in 1975-1994.

	Males (15%)	Females (85%)
mean age	54.6	50.1
duration of complaints in years	7.5	5.6
surgery of both hands in one stage	50%	62%
surgery of both hands in two stages	-	11%
surgery on the right only	28%	18%
surgery on the left only	22%	8%

Table 3. Subjective complaints and preoperative findings.

night pain	97%
impared sensitivity	100%
impared motion, clumsiness	67%
thenar atrophy	37%
disorders of thumb opposition	16%
other pathol. findings+	38%
preoperative med. of Kenalog	49%

+Dupuytren's contraction, ganglia, tendovaginitis, epicondylitis, other syndromes

Table 4. EMG studies prior to surgery - assessed by neurologist.

a slight involvement	17%
a moderate involvement	52%
a severe involvement and a denervation	28%
no check-up examination	3%

Table 5. Peroperative findings - assessed by the surgeon according to the trophism of the nerve, sheets and changes in caliber.

slight changes	26%
moderately severe	35%
severe	38%
anatomic anomalies+	7%

+ trunk duplication, abundant branching, atypic site of origin of motoric branch

Table 6. EMG studies 3 months after surgery.

	Males	Females
unchanged	7%	2%
normal	14%	19%
improvement	64%	73%
deterioration	-	-
no check-up examination	14%	5%

Table 7. Subjective assessment of the postoperative condition 3 months after surgery.

normal hand	21%
improvement	75%
unchanged	1%
deterioration	0.3%
no check-up examination	2%

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OUR EXPERIENCE WITH REOPERATIONS FOR THE DIAGNOSIS OF THE CARPAL TUNEL SYNDROME

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SUMMARY

On the basis of the analysis of the results obtained and of the surgical findings during reoperations for the diagnosis of the Carpal Tunel Syndrome it is recommended to perform a reoperation in cases of primary failure. Underlined is the surgical approach with the use of a prolonged incision, as well as an adequate postoperative care.

ZUSAMMENFASSUNG

Unsere Erfahrungen mit Reoperationen bei der Diagnose des Karpal Tunnel Syndroms

V. Dlabalová

Anhand der Analyse der Ergebnisse und der Peroperativen Befunde bei Reoperationen wegen der Diagnose des Karpal Tunnel Syndroms wird im Falle eines primaren Misserfolges eine Reoperation empfohlen. Betont wird die Operationstechnik mit einer Verlängerung der neuen Inzision und die korrekte postoperative Behandlung.

Key words: Carpal Tunel Syndrome, secondary operation

After primary surgery for the diagnosis of the Carpal Tunel Syndrome persist in a certain proportion of the operated individuals more or less marked subjective complaints. In our series treated throughout many years they were present in 0.67% of surgically treated patients.

During 1993-1994 were performed 27 secondary surgical procedures. Eight of these patients were operated in previous years at our department, while 19 were surgically treated elsewhere.

Two times were recorded fusions and a simultaneous movement with the long flexor of the thumb, three times a knee-like deformation due to the tension of the scars, five times displacement of the nerve towards the ulnar or radial side of the carpal tunel.

We failed to disclose a relation between an incompletely cut retinaculum and subjective complaints which were designated as unchanged, though a certain proportion of the operated patients reported a temporary postoperative improvement.

An immediate postoperative deterioration was ascertained in all patients with a peroperative injury of the nerve. We were surprised by the marked cicatrization which developed also in some patients operated at our department, since we believed that the surgical procedure was performed lege artis. Similarly as in other sites there were obviously individual differences in the development of scars.

CONCLUSION

From this analysis follows that an attempt at a revision after the failure of the first surgical procedure is fully justified. In these cases should be even more strictly kept all advised principles for the determination of the indication and choice of the surgical technique, as well as for the postoperative care and the subsequent follow-up.

A reoperation requires necessarily a new incision which is mostly carried out within the previous scar and is prolonged according to need. An advantage provides the use of a surgical magnifying glass.

As early as on the first postoperative day the surgical wound is irradiated with soft laser, associated with the administration of vitamin B 12 in a dose 1 000 Gamma 2-3 times in a week.

A surgical repair of the opposition of the thumb in a severe atrophy of the thenar is performed simultaneously.

Thus there are still 11% of individuals in whom the revision failed to provide relief. This

Table 1. Composition of the series.

	mean age	number	%	interval after the first operation
Males	45	5	18	0.5-8 years
Females	51	22	82	mean 19 months

amounts to 0.3% of all surgically treated patients. It is our aim to attain a further reduction of their numbers.

Table 2. Subjective assessment of the condition after the first operation.

unchanded, the complaints persist	17	63%
temporary improvement (days till 2 years)	5	18%
immediate deterioration	5	18%

Table 3. Peroperative findings during reoperations.

incomplete section of the retinaculum	9	33%
severe cicatrization	15	55%
peroperative injury of the nerve	3	12%

Table 4. Subjective assessment of the condition after reoperation.

normal function of the hand	4	15%
marked improvement	18	67%
unchanged, no improvement	3	11%
deterioration	0	-
no check-up examination	2	7%

Table 5. EMG check-up examination 3-6 months after the reoperation (assessed by the neurologist).

improvement	14	52%	out of them subj. improvement in 12
unchanged	5	18%	out of them subj. improvement in 2
no check-up	8	30%	
deterioration	0	-	

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THERAPEUTIC POSSIBILITIES IN SOFT TISSUE DEFECTS ON THE DORSUM OF FINGERS

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SUMMARY

The present report deals with the therapeutic possibilities of the management of deep defects of soft tissues on the dorsum of fingers. In addition to the commonly used methods are presented two less common procedures which are in certain cases less time consuming and provide more comfort both to the patient and to the surgeon.

ZUSAMMENFASSUNG

Die Möglichkeiten der Behandlung von Weichteildefekten am Dorsum der Finger

A. Schmoranzová

Der Bericht befasst sich mit den Möglichkeiten der Behandlung von tiefen Defekten der Weichteile am Dorsum der Hand. Ausser den üblichen Behandlungsmethoden werden zwei weniger bekannte Verfahren beschrieben, die in gewissen Fällen weniger zeitraubend sind und sowohl dem Patienten, wie auch dem Chirurgen mehr Komfort bieten.

Key words: defects of the dorsum of fingers, upside-down cross finger flap, dorsal metacarpal arterial flap

In defects of soft tissues on fingers with a detached periosteum or an exposed joint it is not possible to use for their covering a free skin flap, in order to attain a satisfactory function. A small defect can be covered with tissue from its vicinity in the form of a flap with no exactly determined blood supply. They can include a flap shifted along its longitudinal axis, a transpositioned or a rotated flap. A similar flap, however, with an exactly determined blood supply represents an arterial flap from the lateral side of the finger. It is lifted from the lateral nondominant side inclusive of the digital artery, however without the digital nerve which remains intact at the donor site. The flap is rotated in dorsal direction and covers the defect, while the donor site is covered with a skin graft, most convenient is a full thickness graft.

In large skin defects with an exposed joint, or in an injury of this area involving simultaneously several fingers is applied a flap from remote parts of the body, e.g. from the chest, arm, or preferably and most frequently from the abdominal region or from the groin. The flap is lifted to the level of the deep fascia of the muscle, it is partially tubulated and sutured to the defect.

In a injury of several fingers the suture is preceded by a temporary syndactylia which is formed to allow a complete covering of the wound. The syndactylia is disconnected during the third stage of reconstruction.

A large disadvantage of remote flaps is the prolonged immobilization of the hand and of the whole upper extremity, the stiffening of large and small joints, repeated surgical procedures, and the hyposensitivity of the flaps. Beside this the application of flaps from the lower abdomen to the hand leads to the transfer of tissues with an excessive amount of fat and the covering flaps consist of a thick skin. In large injuries of the dorsum of the hand it is not possible to avoid the use of flaps from remote sites, but for the covering of less extensive injuries are presented two convenient alternatives:

1. An upside-down cross finger flap represents a variation of the standard cross finger flap. The surgical procedure: The incision is situated in a similar area as in the standard cross finger flap on the dorsum of the neighbouring finger. However the outlined flap is meticulously deepithelized with a scalpel and subsequently it is lifted to the level of the dorsal aponeurosis and rotated by 180 degrees, as a page in a book, to the defect on the neighbouring finger.

The donor site and the area at the bottom of the rotated flap is covered subsequently with a skin graft. The donor site is somewhat deformed

but after some time the deformation markedly decreases and on the defect is transferred a tissue of good quality and it is not required to immobilizate the whole extremity as it is the case in a transfer of a flap from remote sites.

2. A metacarpal arterial flap is supplied from the dorsal metacarpal artery. It can be applied anywhere on the dorsum between the metacarpal bones up to the retinaculum of extensors, but it should not exceed beyond the latters.

It can be relatively large, about 2-3x5 cm. The flap is detached relatively easily, since it is not necessary to expose the supplying artery. It has a thick pedicle formed by the supplying artery and by soft tissue which was present between the muscles of the dorsum of the hand and the overlaying skin. We proceed up to the metacarpal heads. Between them is situated a point around which the flap is turned and then applied as a cover of the defect on the dorsum of the finger. When the flap is placed as closely as possible to the wrist it can have a long pedicle and it is possible to use the flap for the covering of defects on the dorsum of the middle joint.

CONCLUSION

Both described surgical procedures provide a reliable and technically relatively simple method for the covering of defects in the region of the dorsum of the hand. The perfusion of these flaps is adequate and the surgical effect is very satisfactory. There is a minimum inconvenience for the patient without the need of an immobilization of the upper extremity and the developing secondary defect is very slight. The upside-down flap is used routinely at our department. The metacarpal arterial flap was applied several times and it yielded always very satisfactory effects. We would like to draw attention to a possible combination of both procedures, which is illustrated in the figures.

Fig. 2: Metacarpal arterial flap detached on the dorsum of the hand.

Fig. 3: Metacarpal flap sutured to the site of the middle joint; the pedicle is accentuated above the pean.

Fig. 1: Exposed middle joints IV and V on the right hand; on the dorsum is outlined the planned metatarsal flap.

Fig. 4: A planned upside-down flap.

Fig. 5: An upside-down flap sutured into the defect over the middle joint IV dex; the pedicle is accentuated with the pean.

Fig. 7: Active flexion after the healing.

Fig. 6: Condition after the termination of surgery.

Fig. 8: Passive extension after the healing and prior to the reconstruction of extensors.

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ADDUCTION CONTRACTION OF THE THUMB

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SUMMARY

Adductive contraction of the thumb reduces markedly the grip function of the hand. It develops after an inadequate management of injuries within the 1st interdigital space, because of the oedema associated with injuries of other parts of the hand, after burns, or due to an inborn malformation. The authors discuss the possibilities of the surgical management and the necessity of an adequate postoperative rehabilitation.

ZUSAMMENFASSUNG

Adduktion - Kontraktur des Daumens

B. Šinkorová

Die Adduktion-Kontraktur des Daumens führt zu einer erheblichen Herabsetzung der Greifkraft der Hand. Sie entsteht nach einer insuffizienten Behandlung von Verletzungen im I. interdigitalen Raum, infolge Schwellungen bei Verletzungen anderer Handstrukturen, nach Verbrennungen, bzw. bei angeboren Missbildungen. Die Autoren erörtern die Möglichkeiten der chirurgischen Behandlung und unterstreichen die Wichtigkeit einer fachgemässen postoperativen Rehabilitation.

Key words: adduction contraction of the thumb, therapeutic possibilities

The importance of the thumb for the grip function of the hand is given by its range of motion into adduction and opposition. Because of its construction the thumb represents an independent functional entity. Its loss, or even a limitation of the range of motion in the carpometacarpal and in basal joints leads to a severe limitation of the grip function of the hand.

Causes of an adductive position of the thumb:

1. Injuries in the 1st interdigital region - open wounds and defects, fractures of the 1st metacarpal bone.

2. Injuries of some other parts of the upper extremity

- excessively prolonged fixation,
- prolonged oedems and unsufficient rehabilitation,
- in Volkmanns contraction (so far not uncommon) contraction of the 1st interdigital space due to ischaemia.

3. Burns.

4. Inborn malformations of the hand - distal arthrogryposis (Figs. 1, 2), syndactylia, adduction position of a flexed thumb.

An adduction contracture can be due to:

a) deficient skin cover, or cicatrization in the 1st interdigital space,

b) changes of the joint capsule or a damage to the CMC or the basal joints of the thumb,

c) a damage and a shortening of the m. adductor pollicis and m. interosseus dorsalis due to cicatrization.

Frequently are damaged all above described structures. Particular attention should be paid to fresh injuries within the 1st interdigital space. A dilaceration of the skin cover requires a careful suture. In case of an injury of muscles is required a situation suture and an adduction opposition position of the thumb. In an injury associated with a defect it should be always made an attempt at a primary cover of the defect (Figs. 3-5). In preserved subcutaneous muscles the defect can be covered with a skin graft. Extensive defects should be covered with a primary flap, the choice of which depends on the extent of the defect. If it is smaller it is possible to use with satisfactory results a transpositioned flap from the dorsum of the I or II metacarpal bone (Blauth, Figs. 6-8). In more extensive injuries should be used flaps from remote parts of the body - a direct flap with one pedicle from the hypogastrium or a groin pedicled flap (Mc Gregor). A complete covering of defects is a fundamental prerequisite for a satisfactory functional result. In our series within ten years it

was required to use a flap from a remote part of the body in 7 out of 21 severe injuries of the 1st interdigital space.

The type of reconstructive surgery used in adduction contraction of the thumb due to any cause, depended on the local finding. In a defect of the skin alone it is required to remove completely all scars and the treatment consists in the application of skin grafts. In numerous cases are present both a shortening of muscles and an involvement of the joint capsule. A shifting of the muscles and capsulotomy provide a satisfactory position of the thumb (which can be strengthened by crossed K wires). The method of surgical repair is chosen according to the extent of the defect.

In a series of 144 patients treated in the period of ten years (1984-1994) were used: a simple or double Z plasty in 54 patients, double opposition Z plasty in 13 (Fig. 9), skin graft in 8, transpositioned flap from the metacarpal dorsum in 33 and skin flap from remote parts in 36 patients.

For a satisfactory functional result of these surgical reconstructions is of great importance an early rehabilitation - elevation of the extremity, the maintenance of an adequate position with an elastic band, pressure massage, therapeutic exercises of passive and active range of motion (Fig. 10).

CONCLUSION

Most adduction contraction of the thumb can be prevented or at least reduced the severity of involvement by the correct choice of treatment. In an already present adduction contracture is advised the use of radical therapeutic procedures. An important role plays also an adequate postoperative rehabilitation aimed at the restoration of grip function.

Fig. 2: Result of plastic repair with a flap from a remote part.

Fig. 3: Severe injury of the 1st interdigital space with an explosive.

Fig. 1: Distal arthrogryposis.

Fig. 4: Direct unipedicled flap sutured to the defect.

Fig. 5: Result after the modelling of the flap.

Fig. 8: Transpositioned flap from the dorsum of the 2nd metacarpal bone.

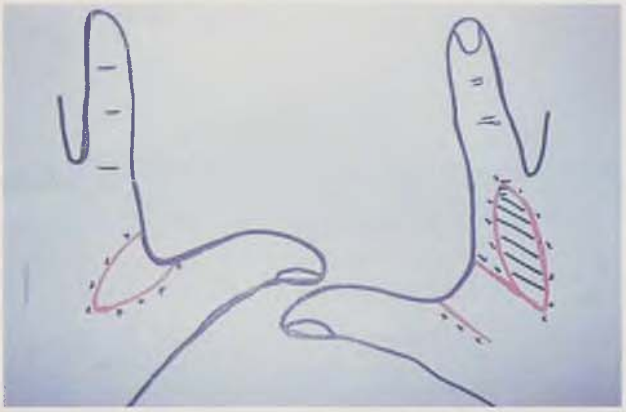

Fig. 6: Planned transposition flap from the dorsum of the 2nd interdigital space.

Fig. 9: Scheme of a double opposition Z plasty.

Fig. 7. Abduction contraction of the thumb after a fracture of the 1st metacarpal bone.

Fig. 10: Elastic band exerting tension on the thumb.

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EARLY REHABILITATION OF THE HANDS AFTER THE SUTURE OF FLEXORS AND AFTER TENDON GRAFTS WITH THE USE OF DYNAMIC SPLINTS

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SUMMARY

The report deals with a new method of rehabilitation of tendons of flexors after the primary treatment immediately after injury or after surgical reconstructions.

ZUSAMMENFASSUNG

Frühe Rehabilitation der Hände nach einer Sutur der Flexoren und nach Sehnenimplantation mit der Anwendung dynamischer Schienen

M. Konířová, B. Šinkorová

Ein Bericht über die neue Methode der Rehabilitation der Sehnen der Flexoren nach der Behandlung einer frischen Verletzung bzw. nach chirurgischen Rekonstruktionen.

Key words: rehabilitation of flexors, dynamic splint, Kleinert's tension, Washington's method

During the last four years was recorded in our Institute a marked improvement of results of an early rehabilitation in patients with sutures of flexors within zone I-II and after surgical procedures using tendon grafts sutured to the flexors of fingers.

The classic method of careful movements from the 7th postoperative day was completely abandoned and was replaced by a rehabilitation technique using dynamic splints and Kleinert's tension (Fig. 1). This method consists of directed movements aimed at exercises of tendons of flexors according to Washington. We have modified this technique by an improvement of the splint used for the rehabilitation of tendon grafts. At the present time this method is used at our department as a routine procedure for the rehabilitation of flexors of fingers.

METHOD

Immediately after surgery is modelled the plaster of Paris splint during a comfortable position of the wrist and fingers. After 3-5 days it is replaced by a definitive plaster of Paris or template splint exactly fitting and maintaining the required angles of flexion. If the patients complain that the position is uncomfortable the prescribed angles of flexion are sometimes reduced by about 10 degrees. The development of contractions is prevented by frequent check-up examinations of the patients. In tendon grafts it is necessary to prevent the development of a deformity of type of swan neck which is due to the absence of the superficial flexor. Between the finger and the splint should be inserted a temporary blocking wedge for the prevention of a full extension of the finger in its middle joint. It is helpful for remodelling - a shortening of the volar capsule and thus preventing a hyperextension of the middle joint. In injuries of the 3rd-5th fingers the dorsal splint is modelled on all fingers, in an injury of the 2nd finger only on this independent finger. This exception is determined by its anatomic specifity. The application of the splint is followed by the creation of Kleinert's tension and the patient exercises only active extension limited by the splint and passive flexion with the help of firm tension. It should not be omitted to place correctly the eye throught which is passed the tension band which should be at the level of the linea transversa of the palm of the hand (Fig. 2). The exercises in a dynamic splint proceed according to the prescribed protocol.

Attempts at active movement begin according to the localization of the injury on postoperative days 15-28 exclusively with the help of an experienced therapeutist, this movement should be carried out only with an assistance and only a few times. The dynamic splint is removed 28 days after surgery and it is advised to apply for further 14 days a protective manchette. After 12-14 weeks the patient is allowed to exercise against resistance (3 kg).

From the beginning of six week Washington's regimen is of paramount importance the co-operation of the patient in the adherence to the exercise regimen. Only in this way it is possible to expect satisfactory result and to appreciate the great advantage of this method i.e. the possibility of a treatment on an out-patients basis. The number of additional surgical procedures is equally markedly reduced after the described primary management. Excellent or good results can be attained within zone I and II in 74% of the patients, after a tenolysis in 69% and after tendon grafts in 45%.

Table 1. Comparison of two methods of rehabilitation of flexors (series from 1993). Results of motion tests of the wrist.

cm	classic+ zone I+II	dynamic splint		
		zone I+II	tendon graft	tendolysis
0	0	7	3	3
1	2	2	1	1
2	3	8	1	5
3	3	7	4	2
4	5	2	1	1
5	1	-	-	-
6	1	-	-	-
7	1	-	1	1
total	16	26	11	13

+ = classic early rehabilitation after primary suture

Fig. 1: Dorsal template splint and Kleinert's tension.

Fig. 2: Dynamic splint for the rehabilitation of the 4th finger.

CONCLUSION

The advantage of a dynamic splint consists in a shorter time of in-patient treatment, the absence of a paradox extension and no rupture of a tendon was recorded in these patients.

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ASSOC. PROF. KAREL DLABAL, M. D.

The contributions written by the team of surgeons from the Department for Plastic and Reconstructive Surgery of the Hand at Vysoké nad Jizerou are devoted to the Head of this Department Assoc. Prof. Karel Dlabal, M. D. who is going to retire this year after 15 years at Hospital.

Dr. Karel Dlabal is one of our best known plastic surgeons. Thanks to his guidance the Department for Plastic Surgery of the Hand gained an excellent reputation, both in our country and abroad. He is not only an erudite surgeon, but equally a very good teacher. He introduced several new surgical procedures into our daily practice of hand surgery. Of particular importance is his method devised for the reconstruction of opposition of the thumb in patients with paresis of the n. medianus. The team of surgeons from the Department for Hand Surgery, the Czech plastic surgeons and the editors of the Acta Chirurgiae Plasticae would like to express their good wishes to Dr. Dlabal in his personal life, as well as much success in his future professional activities.

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July 7-8, 1995

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