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## RECONSTRUCTION WITH DIFFERENT FREE FLAPS IN ORO-FACIAL CANCER PATIENTS

*H. M. Bhathena, D. N. Savant, N. M. Kavarana, D. M. Parikh, V. D. Sanghvi*

Tata Memorial Hospital, Parel, Bombay, India

### SUMMARY

In 75 patients following ablative surgery of head and neck cancer, reconstruction was attempted with free tissue transfer techniques under magnification. It was possible to do free tissue transfers in 69 cases. In 6 cases it was not possible to harvest free flaps successfully and alternative reconstructive procedure was carried out due to unavoidable circumstances and various reasons: 1. unsuitable venous drainage, as in Anterior Rib Osteomyocutaneous Composite Flap, AROCF (2 cases), 2. injury to vessels during flap harvest, as in parascapular flap (1 case), 3. residual disease unable to excise (2 cases) and 4. unsuitable proposition (1 case), due to emergency curfew imposed suddenly. These 6 cases were not included in the study. Free tissue transfer was successful in 64 cases (92.7 %) and there was a total failure in 5 cases where delayed secondary salvage surgery was performed. Out of 69 cases, in 65 cases reconstructions were carried out immediately, primarily as one-stage operative procedure. Their functional, cosmetic results and complications during the operative and post-operative period are analyzed and discussed. Inter-maxillary fixation was never used to maintain the bite alignment. All cases were given a bite guide prosthesis in the early post-operative period, to improve the bite alignment when it was necessary.

### ZUSAMMENFASSUNG

#### Die Rekonstruktion mit verschiedenen freien Lappen bei Patienten mit oro-fazialen Krebserkrankungen

*H. M. Bhathena, D. N. Savant, N. M. Kavarana, D. M. Parikh, V. D. Sanghvi*

Bei 75 Patienten nach einer ablativen Chirurgie wegen Kopf- und Halskrebs erfolgte unter mikroskopischer Vergrößerung die Rekonstruktion durch freie Gewebsübertragung. In 6 Fällen war nicht möglich die freien Lappen zu gewinnen und alternatives Rekonstruktionsverfahren wurde infolge der unvermeidlichen Gelegenheiten und verschiedener Gründe angewandt. Siehe 1) ungünstige venöse Drainage wie in Anterior Rib Osteomyocutaneous Composite Flap, AROCF (2 Fälle), 2) Verletzung der Gefäße während der Lappenentnahme wie bei dem Paraskapularenlappen (1 Fall), 3) residuale Krebskrankheit wegen der Unmöglichkeit einer totalen Exzision (2 Fälle), 4) Änderung der Proposition (1 Fall) infolge des urgenten Notfalles. Diese 6 Fälle wurden nicht in die Studie angereicht. Die freie Gewebeübertragung war in 64 Fällen (92,7 %) erfolgreich. 5 Fälle waren erfolglos. Zu ihrer Rettung erfolgte eine weitere Operation. Von 69 Fällen wurde bei 65 Fällen die Rekonstruktion gleich durchgeführt, primär wie einzeitige Operationsmethode. Ihre funktionellen kosmetischen Ergebnisse und Komplikationen während der prä- und postoperativen Zeitperiode wurden analysiert und diskutiert. Niemals wurde eine intermaxillare Fixation zur Erhaltung des Bisses angewandt. Alle Fälle bei denen es notwendig war, wurden mit den Zahnprothesen postoperativ behandelt.

**Key words:** head and neck cancer, free flap reconstruction

The superiority of free tissue transfer is well established in primary reconstruction following ablative cancer surgery. Vascularized bone graft is the method of choice for mandibular reconstruction, either as pedicled or a microvascular free graft, in middle third mandibular defects (1, 2, 5). Most of the head-neck and oro-facial cancer patients are elderly, in whom extensive reconstructions are performed after radical cancer ablation. The challenge of reconstruction in these

patients is three-fold; to provide suitable composite tissue including bone at times, near normal-looking facial contour following the operation, and preservation of basic functions like mastication, speech and swallowing. It is very essential to replace all missing tissue components, like skin, bone, muscle and mucosal lining in these patients following the ablation, causing through and through defects. These patients should be the least debilitated so that they can be rehabili-



tated promptly and easily after the surgery. Hence, one stage aggressive reconstruction is always preferable over delayed reconstruction in these patients.

## MATERIALS AND METHODS

Over a period of 6 years, (1987 to 1993), at Tata Memorial Cancer Hospital, in 75 orofacial cancer patients reconstruction was attempted with free tissue transfer techniques under magnification following the ablative cancer surgery. Ablative and reconstructive surgery were carried out synchronously by two separate teams. There were 60 male and 15 female patients of varying ages, from 14 to 65 years with mean age of 43.1 years. Follow-up ranged from 6 months to 5 years.

The anatomy and methods of harvesting various flaps have been well described (1-8). Use of composite flap in bipaddled fashion for mucosa lining and skin cover simultaneously, and for primary total mandibular reconstruction have been reported by authors (1, 2, 3). Fixation of the bone was achieved by interosseous wiring in all cases. Tracheostomy was done only when indicated as in the midline lesions or when excision crossed the midline. All patients had either feeding nasogastric tube or temporary gastrostomy in a few extensive resections. All patients were encouraged to take water orally as early as from 3rd post-operative day.

### Extent of disease

All these patients had advanced disease. All tumors were stage IV. Homolateral modified neck node dissection was carried out in all oral squamous cancer cases. Out of these, 52 had cheek buccal mucosa involved, 10 had floor mouth and middle third mandible involvement, 6 cases had skin cancer and one had embryonal rhabdomyosarcoma of the maxilla (Table 1).

Table 1: Type of lesion and extent of excision.

ORAL CANCER	62
Wide excision with modified neck node dissection	26
Hemi-mandible, wide excision with modified neck node dissection	20
Middle third mandible, floor mouth with modified neck node dissection	10
Marginal mandible, wide excision with modified neck node dissection	4
Segmental mandible, wide excision with modified neck node dissection	2
Skin cancer of face	6
Embryonal rhabdomyosarcoma of maxilla	1
Total	69

Of these, 7 patients had recurrent disease and were treated earlier either with radiation, surgery or chemotherapy elsewhere. Two patients

had received preoperative chemotherapy. Two patients had received the full dose of curative radiotherapy before surgery of recurrent disease. Three patients had undergone some kind of cancer surgery before and were referred to us for the treatment of recurrent disease. One patient of embryonal rhabdomyosarcoma of the maxilla, had received both chemotherapy and radiotherapy as a curative measure prior to delayed reconstructive surgery.

### Reconstruction

Different types of flaps were harvested successfully in these 69 patients as listed in Table 2. In 6 cases, it was not possible to harvest free flaps successfully, and alternative surgical procedure was carried out due to unavoidable circumstances and various reasons: 1. unsuitable venous drainage, as in Anterior Rib Osteomyocutaneous Composite Flap, AROCF (2 cases), 2. injury to vessels during flap harvest, as in parascapular flap (1 case), 3. residual disease unable to excise (2 cases) and 4. unsuitable proposition (1 case) due to emergency curfew imposed suddenly. These 6 cases were not included in the study. The effective number for study was 69 patients. In 36 cases mucosal lining was replaced by skin island, whereas in 27 patients, oral lining and skin cover were both provided by a single flap in either folded or bi-paddled fashion. In 12 cases mucosa, skin and bone as well were provided by a single free flap transfer. Bone defects from 8 to 10 cm were reconstructed in these 12 patients with 8 cm to 10 cm long rib included with AROCF flap, or upto 10 cm long iliac bone included in DCIA flap for mandibular reconstruction (Table 2.).

Table 2: Types of free flaps successfully harvested.

Radial artery forearm flap	55
Single paddled	30
Bipaddled	24
Folded	1
Anterior rib, osteomyocutaneous composite flap (AROCF)	8
Single paddled	6
Bipaddled	2
Deep circumflex iliac artery flap	4
Lateral arm flap	2
Total	69

The microarterial anastomosis time varied from 15 min. to 40 min. and microvenous anastomosis time varied from 17 min. to 40 min. per anastomosis. Total ischaemia time varied from 50 min. to 3 hrs. Tourniquet time was observed in the forearm flap varying from 25 min. to 1 hr. The total operation time on an average was 7 hrs. Out of 69, in 45 cases the facial artery was used as

recipient artery. In the remaining patients the lingual, superior thyroid, ascending pharyngeal and external carotid arteries were used in 8, 8, 6, and 2 cases respectively. In 38 cases the linguo-facial venous complex was used for recipient vein drainage. The internal jugular and external jugular veins were used in 13 and 10 cases respectively. The ablative procedure was so extensive that all local recipient veins were sacrificed in 8 cases, where it was required to raise forearm flap on a long cephalic venous pedicle, and the cephalic venous pedicle in continuity was transpositioned to facilitate venous drainage. In these cases only micro-arterial anastomosis was performed in the neck. In one case a 7 cm long interposing vein graft was used to facilitate the venous drainage. In 4 cases the radial artery vena-comitans were used as donor veins.

Interrupted 10/0 nylon on bv5 needle was used in all cases except in 8 venous, end to side anastomosis where the posterior suture line was continuous. All arterial anastomosis were end-to-end except on 2 occasions where the recipient vessel was external carotid with large vessel size discrepancy.

## RESULTS

Free flap survival was 92.7 % (64/69). Peri-operative deaths were encountered in no patients. There were problems of vessel anastomoses in 14 patients. Fifteen anastomotic sites were re-explored at different time intervals in different patients (Table 3). Out of these 14 patients with various anastomotic site problems, in 5 patients (4 cases of bipaddled radial forearm flap, 1 case of bipaddled AROCF flap), flap could not be salvaged inspite of active surgical intervention and there was a total flap loss. Out of these, in one case after 24 hrs. on re-exploration, an arterio-venous shunt between the distal end of the radial artery and the proximal end of the cephalic vein was performed to salvage the flap. In total flap loss cases alternative flap cover was provided at a later date. Out of 14 reexplored cases, 4 cases resulted into partial flap loss.

Out of 55 radial forearm flaps, 12 cases had donor site minor complications. Out of 8 AROCF, in 2 cases the pleura was opened and was treated with closed thoracic drainage. Secondary minor corrective surgery was required in 8 cases. Other complications at donor site and recipient site are enumerated in Table 3.

Post-operative follow-up period varied from 6 months to 5 years. Fifteen patients had developed loco-regional recurrence within 5 months to 10 months of follow-up period. Six patients died of unrelated disease and 10 patients died due to recurrent disease at the end of the one year follow-up period. There were 20 patients alive and disease-free at the end of the 2nd year.

Table 3: Survey of complications.

Intra-operative	
Vessel spasm	4
Pleural injury	2(AROCF)
Redo arterial anastomosis	2
Peri-operative	
Re-do of anastomosis	
within 6 hrs	3 arterial
within 24 hrs	2 venous and 3 arterial,
	venous (both)
after 24 hrs	4 venous
Postoperative	
Recipient Site	
Total loss	5
Partial loss	4
Superficial loss	4
Partial breakdown	4
Oro-cutaneous fistula	5
Hematoma and Collection	8
Parotid fistula	4
Cellulitis/wound infection	3
Donor Site (Forearm flap)	
Tendon exposure	2
Weakness/stiffness of wrist	4
Loss of SSG	6

## DISCUSSION

The advantages of the free tissue transfer with microvascular surgery has been well documented in the surgical literature. The vascularity of the newly brought in free tissue transfer enhances the primary healing and reduces the chances of fistula, infection and breakdown even in hostile recipient bed in post radiated cases. The major obstacle in head and neck cancer reconstruction surgery is a potentially infected area even in small lesions, especially when an oral cavity is involved.

Free tissue transfer with microvascular techniques allows a single-stage operative procedure which reduces the total post-operative hospital stay, and the patient resumes his/her social activities in the shortest possible time. Autologous tissue for composite reconstruction as in middle third arch mandible reconstruction, permits for future complete dental rehabilitation with the help of osseointegrated implants. Immediate single stage reconstruction is always preferable when it can be achieved to maintain the quality of life with an acceptable success rate and low morbidity. This is more true in patients with advanced head and neck cancer where palliation, if not cure, is crucial to maintain the quality of life. The ability of free tissue transfer to heal in adverse conditions makes it superior for oro-facial cancer reconstruction, especially in radiation failure cases.

Though it is a small series, free flap survival rate was 97.5 %. This compares well with a study by McNamara et al. who had analysed 60 cases



Fig. 1 a: Middle third mandible, floor mouth lesion.  
Pre-operative photograph.



Fig. 1 c: Post-operative result. Front face.



Fig. 1 b: Deep circumflex iliac artery (DCIA)  
free flap marked out.

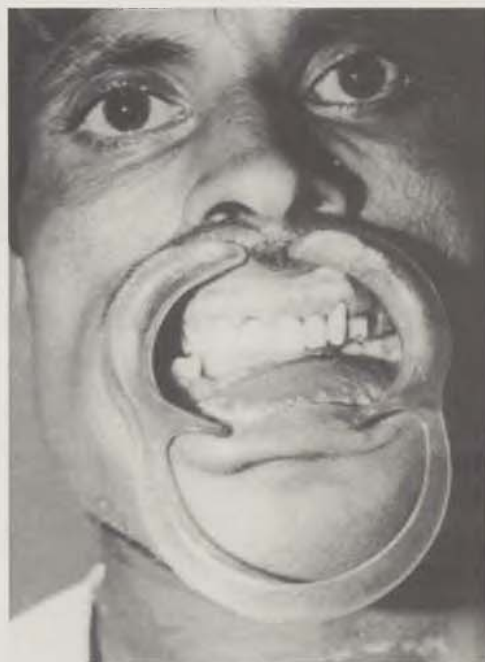


Fig. 1 d: Post-operative result. Intra-oral view.

over a 10 year period with a success rate of 54/60 = 90 % (6). Overall we prefer the end to end microvascular anastomosis especially for low pressure channel anastomoses. End to side anastomosis was attempted in few circumstances. It was observed that end to side anastomosis were the one which gets blocked especially in the low pressure channel. In end to side anastomosis, a fish mouth opening in the side wall with the widest possible lumen is preferred. This allows the side wall lumen to remain open and prevents the lu-

men blockage by thrombus formation, especially in low pressure channel.

Aggressive wide excision of oro-facial cancer to have tumor free cut margins is essential and can be achieved with the help of peri-operative frozen section. For ensuring a tumor free bone margin one has to depend on clinical judgement and radiographs. It is advisable to go fairly wide enough for bone excision. Middle third mandible and floor mouth reconstruction is done with free composite flap including vascularized bone graft





Fig. 2 a: Right buccal mucosa cheek lesion. Pre-operative view.



Fig. 2 b: Pre-operative, intra-oral view.



Fig. 2 c: Extended pedicle lateral arm free flap marked out.



Fig. 2 d: Defect after ablative surgery.



Fig. 2 e: Post-operative result. Front view, mouth open.



Fig. 2 f: Post-operative result. Mouth close.

and skin/muscle components; whereas in lateral segment defects and hemimandibulectomies it is not mandatory to do skeletal replacement, especially when a bulky composite flap has been used in bipaddled fashion. In cases where marginal or segmental mandibulectomies are performed and there is less volume replacement needed, usually a non-bulky flap like forearm flap or lateral arm flap is preferred. These flaps provide a thin pliable skin paddle for lining and skin coverage simultaneously. Forearm osteo-cutaneous flap is best reserved for the small segment of bone replacement along with skin and intraoral coverage (4).

The choice of flap depends upon the total volume and various components of tissue replacement, either with or without skeletal support. Adequate soft tissue replacement with mucosal lining and skin cover is mandatory. Large tissue dead space under the bony arch in exten-

sive floor mouth lesions should be filled up with muscle component of composite flap. AROCF and iliac crest composite flap are preferable in this situation, as both can provide ample soft tissue bulk to fill out large tissue dead space. Compared to iliac crest composite flap, AROCF provides a very large skin island to be used in bipaddled fashion for mucosal lining and skin cover simultaneously. It also provides the longest available bony component for total mandibular reconstruction, though quality-wise bone is not as good as iliac crest. Iliac crest flap has its own advantage of having a natural curve and kind of bone available for mandibular reconstruction. Significant limitations with iliac crest composite flap include difficulties with bone shaping, three-dimensional positioning of the skin island with relationship to the bone, and separation of skin paddles for simultaneous external and intraoral coverage (5).



Fig. 3 a: Middle third mandible, floor mouth lesion.  
Pre-operative photo.



Fig. 3 b: Pre-operative intraoral view.



Fig. 3 c: Post-excision defect with AROCF marked out.



Fig. 3 d: AROCF dissected out. Internal mammary vessels pedicle seen prior to its disconnection.



Fig. 3 e: Post-operative result, reconstruction with free AROCF. Mouth closed.

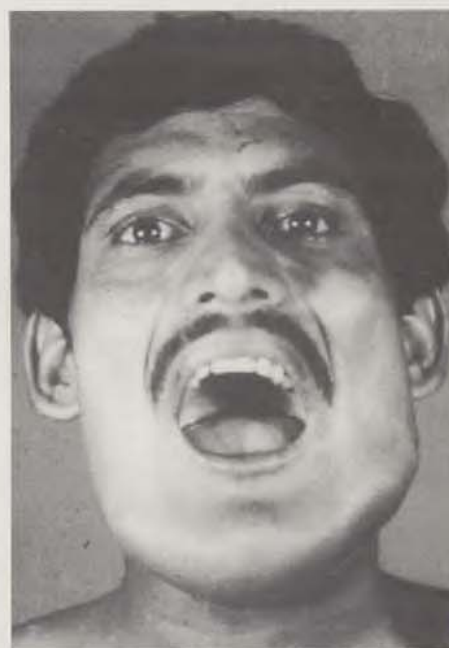


Fig. 3 f: Post-operative result, reconstruction with free AROCF. Mouth open.

Table 4: Functional results.

	n = 69	%
Diet:		
Normal	52	75
Soft	10	15
Tube	7	10
Oral continence:		
Normal	54	78
Slight drooling	9	13
Severe drooling	6	9
Speech:		
Easily understood	52	75
Unintelligible	10	14
Poor but intelligible	7	10
Social activities:		
Normal	45	65
Diminished	24	35
Facial appearance:		
Excellent/good		
Patient	36	52
Surgeon	44	64
Acceptable		
Patient	10	14
Surgeon	11	15
Poor		
Patient	23	33
Surgeon	14	20

Functional and cosmetic results (Table 4) were generally satisfactory and were excellent where excision was limited. Inter-maxillary fixation is never used to maintain the bite alignment. All cases are given a bite guide prosthesis in the early post-operative period, to avoid the jaw deviation and to improve the bite alignment. This is necessary especially in case where mandibular reconstruction is exempted. Functional and cos-

metic results depend mainly on the extent of the excision and reconstruction, the patients tissue quality, the willingness of the patients to co-operate and patients motivation. It reduces the hospital stay and rehabilitation can be achieved in the shortest possible time.

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# LONGITUDINAL FOLLOW-UP OF CHILDREN AFTER SURGICAL TREATMENT OF SCAPHOCEPHALY

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## SUMMARY

78 patients underwent surgery for scaphocephaly at the mean age of 1.2 (0.2 - 14.7) years in Faculty Hospital Motol in Prague. All operated children („free bone flap“ technique) have been longitudinally followed-up by the same neurosurgeon and by the same anthropologist. Non-invasive direct cephalometry has been an inevitable part of diagnostics, surgical treatment indication, postoperative follow-up and evaluation of the outcome of the treatment. Better cosmetic results in children operated before one year of age (the change of index cephalicus 6.5 units) in comparison with those treated later (3.7 units) is demonstrated ( $p = 0.02$ ).

## ZUSAMMENFASSUNG

### Langzeitige Verfolgung der Kinder nach der chirurgischen Behandlung der Skafocephalie

H. Krásničanová, D. Zemková, I. Škodová

Im Universitätskrankenhaus Motol wurden 78 Patienten mit einer Skafocephalie im Durchschnittsalter von 1.2 (0.2 - 14.7) Jahren chirurgisch behandelt. Sämtliche operierte Kinder (mit „free bone flap“ Technik) wurden langfristig von einem Neurochirurgen und einem Anthropologen verfolgt. Die nicht - invasive Methode der direkten Cephalometrie erfolgte in der Auffassung der erwähnten Abteilung in Motol als ein untrennbarer Teil der Diagnostik der Craniosynostosis, der Indikation zu ihrer chirurgischen Behandlung, der postoperativen Verfolgung und der Bewertung des Operationserfolges. Ein besseres kosmetisches Ergebnis erzielten die Autoren bei bis zum ersten Lebensjahr operierten Kindern als bei Kindern, die nach dem ersten Lebensjahr operiert wurden (Veränderung der Gestalt des Neurocranium nach cephalischem Index um 6.5 Punkte gegenüber 3.7 Punkten,  $p = 0.02$ ).

**Key words:** scaphocephaly, direct cephalometry, free bone flaps technique, longitudinal follow-up, index cephalicus, cosmetic result of operation, age at the time of surgery

Scaphocephaly or sagittal synostosis is a premature obliteration of the sutura sagittalis and has been proved as a dominative among the isolated (non-syndromic) craniosynostoses (Cohen etc.). The cranium is extremely elongated and narrow, with a marked decrease in cephalic index (head width x 100/head length) and increase in head circumference. For the scaphocephaly it is characteristic the inversion of the cranial configuration. That means that the biggest width of the cranium, defined as the distance between euryons, is localized in its anterior half. Large width of the prominent forehead with above mentioned characteristics of the calvaria are indicated in our work team as the „markers“ of scaphocephaly.

Contemporary attitude to the problem of scaphocephaly needs the exact diagnostics, selection of the adequate surgical treatment, the long-

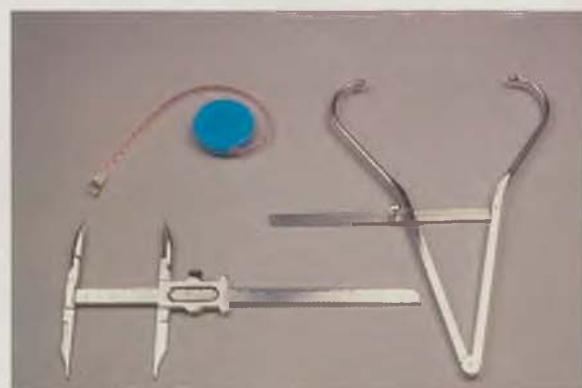


Fig. 1: Instruments for direct cephalometry.

term follow-up of patients and precise evaluation of the results. This all includes the application of the method of so called „direct cephalometry“



(Fig. 1). The direct cephalometry contributes both to the diagnostic assessment and to the evaluation of the surgical treatment. It is a non-invasive, very rapid, arbitrary repeatable and cheap method with the high informative value.

## MATERIAL AND METHODS

Since 1981 till 1994 207 children underwent surgery for craniosynostosis at Neurosurgical Department, Faculty Hospital Motol-Prague, 95 of them for scaphocephaly. 78 of these patients has been longitudinally followed-up. Mean age of these children at the time of surgical treatment was 1.2 years, the youngest child was 0.2 years, the eldest 14.7 years old. Contemporary mean age of our sample is  $6.9 (\pm 4.3)$  years. The mean time of postoperative follow-up of our group is now 5.7 years.

Direct cephalometry with the x-ray and clinical examination constitute the diagnosis of scaphocephaly. On the basis of our own experience (3, 4, 6) with cephalometry the „cephalometric minimum“ has been applied:

1. head circumference
2. head length
3. head width
4. forehead width
5. skull base width
6. transversal head arch
7. inner intercanthal distance
8. outer intercanthal distance
9. face width
10. morphological height of face

The relation between the width and the length of the head - the cephalic index - is obligatorily used for classification of the head configuration. In the contemporary Czech population of the youngest children 90 % of cephalic index values is in the range 72.5 - 84.5 units (4).

The measured cephalometric parameters are compared with our own recent control sample of healthy children (3, 4). The measured cephalometric values are expressed as a standard deviation score (SDS). This is calculated for any dimension of the head using the formula

$$SDS = \frac{x - X}{SD}$$

where  $x$  is the patient's value,  $X$  and  $SD$  being the mean and standard deviation respectively of the given dimension at the patient's age.

All patients have been operated by our own modification of Rouguerie's technique (Fig. 2). We create 6 - 9 free bone flaps on the dura after removing 3 - 5 mm wide bone strips by means of craniotome. The size and shape of bone flaps depends on the configuration of the neurocranium. Temporal bones are released from the skull base and reshaped.

We use direct cephalometry also for objectivization of the surgical treatment and growth dy-

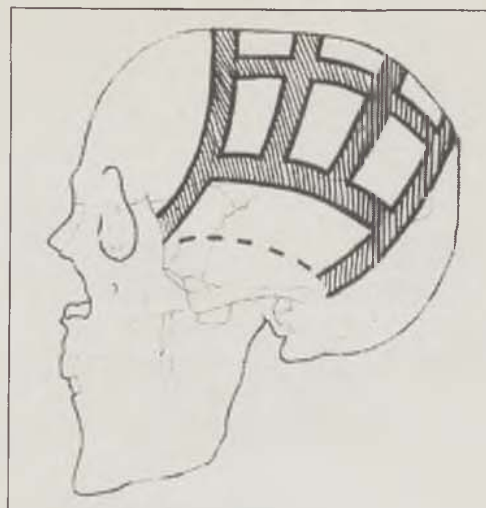


Fig. 2: Scheme of Rouguerie's technique.

namics of neurocranium after surgery. The first postoperative cephalometric check has been performed 6 months after the surgery. Till 3 years of age children are examined in 6 months intervals, older children once a year.

The group of our operated patients was divided into two subgroups according to the age at the time of surgery: children treated before one year of age ( $n = 52$ ) and the children operated later ( $n = 26$ ). The results of preoperative and postoperative cephalometry were statistically evaluated by means of the Student  $t$ -test and simple regression analysis.

## RESULTS AND DISCUSSION

Mean value of preoperative cephalic index is  $67.4 (\pm 3.8)$ , postoperative mean value is  $72.9 (\pm 4.9)$ , its mean increase is in average 5.5 units.

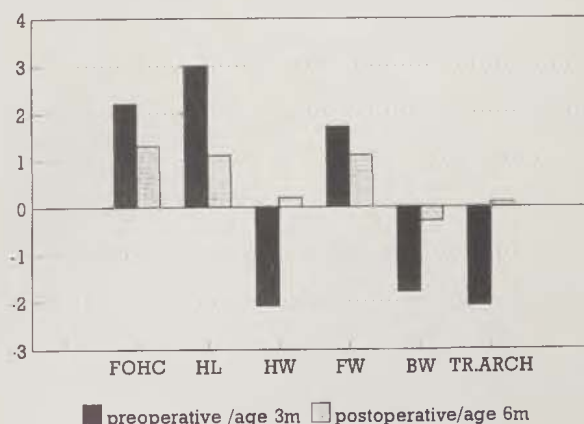


Fig. 3: Changes of cephalometric parameters expressed in SD score for the typical scaphocephalic patient before and after surgery: FOHC - frontooccipital head circumference, HL - head length, HW - head width, FW - forehead width, BW - skull base width, TR.ARCH - transversal head arch, all values are expressed in SD score.

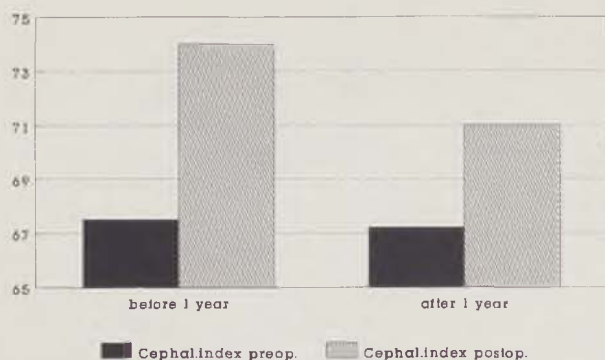


Fig. 4: Changes of head configuration (expressed in index cephalicus) in relation to the age at the time of surgery.



Fig. 5



Figs. 5, 6: A girl aged three months with scaphocephaly before surgery; index cephalicus 59.6.



Fig. 7



Figs. 7, 8: The same patient aged 11 months, four months after surgery; index cephalicus 73.0.

Therefore the head configuration was changed by the surgery from hyperdolichocephalic to dolichocephalic one. This difference is statistically significant on the 5 % significance level and the cosmetic effect is evident. Fig. 3 shows the change of cephalometric parameters expressed in SD score for the typical scaphocephalic patient before and after surgery. Though studies with quantitative assessment of skull deformity and surgical results exist (e.g. Posnick), we have not found in the literature the work using our type of evaluation.

The „cosmetic effect“ expressed by the difference between pre- and postoperative cephalic index was significantly correlated with the age at the time of surgery ( $r = -0.26$ ,  $p = 0.02$ ). The preoperative configuration of both groups was hyperdolichocephalic in the same degree.

The postoperative shape change of the neurocranium and consequently the cosmetic effect was significantly greater in the subgroup of children operated before 1 year of age: 6.5 units of the index cephalicus versus 3.7 units in patients operated later (see Fig. 4). Our findings are in good agreement with reports of Hassler and Zentner, they found optimal cosmetic results in patients treated up to 6 months of age (2).

### CONCLUSION

Direct cephalometry is a valuable method for the head shape evaluation in craniosynostoses during pre- and postoperative period. It is a part of diagnostics and surgical indication. During the postoperative period it is a marker of cosmetic successfulness of surgical treatment and it is a non-invasive method for objectivization of neurocranial growth during postoperative period.

Our study proved that better cosmetic effects of our simple non-remodelling procedure are ob-

tained in children treated before one year of age. The cosmetic results of this procedure are significantly worse with higher age of patients and more complicated procedures have to be used for the same cosmetic result.

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## FIXATION OF THE TONGUE BELLOW MANDIBLE IN PIERRE ROBIN SYNDROME

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### SUMMARY

For some children with a diagnosis of Robin syndrome the conservative treatment will not be sufficient due to recurrent glosptosis and acute obturation of the airways which leads to asphyxia.

The risk for children with this complication is so serious that it needs emergency surgical treatment. Its aim is an artificial ankyloglosis. However, often it fails when the stitches cut through. The technique of tongue fixation presented in this paper has proved successful.

### ZUSAMMENFASSUNG

#### Die Fixation der Zunge unter den Unterkiefer bei Pierre Robin's Syndrom

*J. Ramba*

Bei manchen Kindern mit Robin's Syndrom Diagnose reicht die konservative Behandlungsverfahren nicht, weil es zur wiederholenden Glosptosis und zum akuten Verschluss der Oberatemwege kommt. Dies führt zu den asphyktischen Entfällen. Die Gefahr durch diese Komplikation ist so hoch, dass sie eine urgente chirurgische Behandlung benötigt. Ihr Ziel ist die künstliche Ankyloglosie. Manchmal ist sie jedoch erfolglos, weil die angelegten Nähte durchbrechen. In der Arbeit wird die Technik der Zungenfixation eingeführt, die uns gute Erfolge brachte.

**Key words:** Robin syndrom, tongue fixation, ankyloglosis

The present incidence of migrogenia, glosptosis and cleft palate belongs to combined anomaly known as Pierre Robin Syndrome.

He described this trias of main symptoms in the year 1929. Although it was known in the 19th century as „stridor inspiratorius congenitus“. Apart from the mentioned symptoms this anomaly is associated with median cleft of the mandible, microglosis and subtotal cleft tongue. The additional defects are microcephaly (even hydrocephalus), ptosis, microphthalmia, cataract, strabism, retinal anomalies, sternum dysplasia, spina biphida, dysplasia of hip joints and heart anomalies (defects of the atrial or ventricular septum, Fallots tetralogy). Later on it is also possible to discover psychomotoric retardation as a result of brain hypoxia at neonatal age.

Children with anomaly require high attention and individual nursing care especially during their first weeks of life.

They are immediately threatened by asphyxia produced by the tongue falling into the cleft palate and the nasopharyngeal space. Or when the

tongue narrows or blocks the breathing space and unfavourably affects the epiglottis by pressure.

Due to repeated acute obstructions of the upper airway or even by aspiration the child's condition becomes complicated by bronchopneumonia and gradual heart weakness.

The result is cor pulmonale, which is also the sectional finding. Tracheostomy is not convenient at this age since the trachea is often damaged irreparably.

The main task of the medical and nursing care is to overcome the dangerous period of life during the first months. Asfyxia is usually corrected spontaneously by thickening of the tongue muscles of the oral floor and pharynx and by the mandibular growth.

There are a few methods of treatment of this life threatening anomaly:

#### 1. Methods of jaw orthopedics

(obturator according to Piellou and Allen or Dibelka)

#### 2. Surgical methods of the tongue



Bewerley - Douglas operation (fixation of the tongue to the lower lip mucosa)

Blocker - Lewis operation (tongue fixation to the medial part of mandible with strips of fascia lata)

Wexler et al. operation (dynamic fixation of the tongue base to the mandible with the tongue muscle flap)

### 3. Surgery of the mandible

Hadley operation (fixation of the mandible with wires inserted into jaw angles)

Eschler's operation (transposition of the frontal part m. masseter muscle from the mandibular body into the ramus)

Kipikaša operation (mandibular traction with double anterior hinges)

### 4. Conservative methods

Head plaster fixation (Dennison)

Pulling of the tongue with temporary fixation (according to Toussaint)

Interrupted extension of the mandible (Longmire and Sanford or Stellmach)

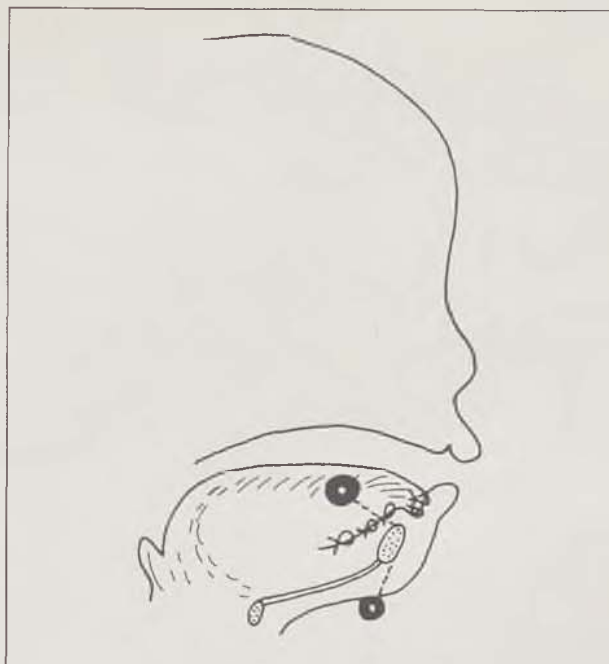


Fig. 2: Location of the tongue fixation (lateral view).

## METHOD

In general anesthesia we perform gradually: excision of the tongue frenulum and then excision of mucosa of the alveolar ridge (between the buds of deciduous teeth) and of the mucosa and muscle of the lower lip. The tongue is pulled forwards and its base is sutured to the oral floor, the ridge and musculature of the lower lip with slowly absorbable thread.

Then we pull through the tongue musculature from one side to the other a rubber cannula the surface of which should be roughened with a bone file or with a rasp. The cannula must overlap the tongue edges by 2-3 mm. It is placed between the front and the medial third of the tongue. We pull into the cannula thicker nylon thread and pull its ends through below the chin periost (from the

lower oral vestibulum under the edge of the chin) and out through the skin. Both threads run through parallel with the edge of the tongue. Then we pull one of the ends through a similar rubber (not roughened) cannula and after making it tight we tie a knot with both threads. The cannula leans softly against the skin while it is fixed at the lower edge of the bony chin.

The skin insertions are covered with sterile cotton pads (Figs. 1 and 2).

In the postoperative care the attention is paid to perfect oral hygiene inclusive of the extra-oral part of the stitches. This stitch fixation may be discarded after a few weeks (5 - 7 weeks). The resulting ankyloglossia hinders the glosptosis.

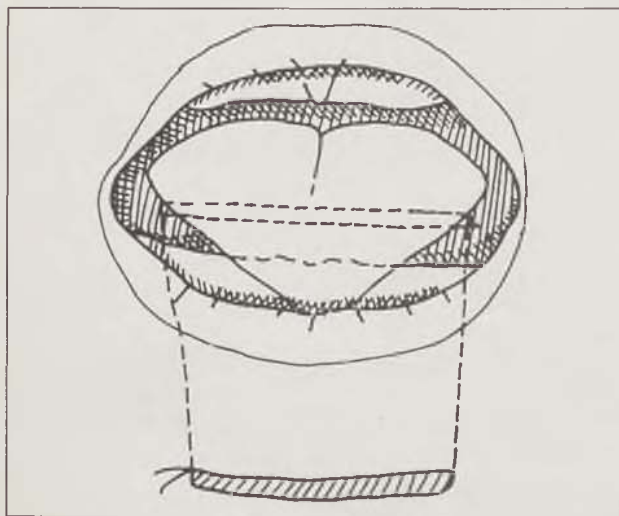


Fig. 1: Location of the tongue fixation (frontal view).

## DISCUSSION

The cannula placed in the tongue must be made of india-rubber, a plastic (nylon etc.) cannula could cut through the musculature. The children's muscle fibres are very fragile. Our experience with such fixation is very good. For most patients the tongue fixation alone is sufficient and the stitching ankyloglossia is not necessary. The surgery is simple and efficient. The newborn is not burdened with the short anesthesia. There is neither need of special instruments during the operation nor in the postoperative care. The postural management is not usually necessary and the high risk of acute obturation of the upper airway is reduced.

Child nutrition is not interrupted because swallowing is normal.

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## SEX DIFFERENCES IN THE INCIDENCE OF OROFACIAL CLEFTS AND THE QUESTION OF PRIMARY PREVENTION IN FAMILIES WITH GENETIC RISK

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### SUMMARY

Systematic registration of all children with orofacial clefts in Bohemia (Czech Republic) started at the Clinic of Plastic Surgery, Prague in 1964. A sample of 181 affected children with positive family histories (i.e. one of the parents had some type of orofacial cleft) was selected for the present study. The aim of this study was to follow the relation not only between the type of cleft in the child and in its parent, but also between the sex of the child and of the affected parent. Among children of mothers with cleft lip 68 % were boys and only 32 % were girls with cleft lip or cleft lip and palate. If the mother had cleft lip and palate, the same cleft type was found in 64 % of boys and only 15 % of girls. If the mother had cleft palate, the same cleft type was found in 37 % of boys and 51 % of girls. Very similar results were found for affected fathers and their children, with only one exception: among children of fathers with cleft lip and palate, the percentage of boys and girls with CLP was 43 % and 40 %, respectively.

We can conclude that the cleft type in a child depends not only upon the cleft type present in the mother or father, but also upon the sex of the child. There was higher risk to have the orofacial cleft in sons of mothers with CL or CLP or fathers with CL and daughters of mothers or fathers with CP. The combination of the preconception choice of the sex of the baby with the ultrasonography method for the prenatal screening of malformations could decrease the risk delivering a child with an orofacial cleft in families with a genetic predisposition.

### ZUSAMMENFASSUNG

#### Die Geschlechtsunterschiede im Vorkommen von der orofacialen Spaltmissbildungen und die Frage der primären Vorbeugung in den Familien mit genetischem Risiko

M. Peterka, R. Peterková, M. Halašková, M. Tvrdek, M. Fára, Z. Likovský

Die systematische Registrierung aller lebenden im Böhmen geborenen Kinder mit orofacialen Spaltmissbildungen begann an der Klinik der plastischen Chirurgie in Prag im Jahre 1964. Die Gruppe von 181 betroffenen Kindern mit einer familiären Anamnese, da stets einer der Eltern eine orofaciale Spaltmissbildung aufwies. Das Ziel dieser Studie war die Bestimmung des Verhältnisses nicht nur zwischen dem Spaltentyp bei dem Kind und seinen Eltern, sondern auch das Verhältniss zwischen dem Geschlecht des betroffenen Kindes und den Eltern. Die Mütter mit Lippenspalten hatten 68 % der Jungen und nur 32 % der Mädchen mit Lippen- oder Gaumenspalten. Wenn die Mutter an Lippen- und Gaumenspalteung leidete, derselbe Spaltungstyp wurde bei 64 % der Jungen und nur bei 15 % der Mädchen festgestellt. Wenn die Mutter eine Gaumenspalte hatte, derselbe Spaltentyp wurde bei 37 % der Jungen und bei 51 % der Mädchen festgestellt. In den Familien, in welchen die Väter mit Spalten betroffen wurden fanden wir ähnliche Ergebnisse. Nur eine Ausnahme existiert: bei Vätern mit Lippen- und Gaumenspalten hatte der selbe Spaltentyp fast gleiche Anteile der Jungen (43 %) und Mädchen (40 %). Abschliessend kann gesagt werden, dass ein Vorhandensein einer Missbildung beim Kind nicht nur von dem Spaltentyp bei den Eltern, sondern auch von dem Geschlecht des Kindes abhängt. In den Familien mit genetischer Belastung könnte das Risiko der Entstehung einer Missbildung herabgesetzt werden. Dies könnte durch die prekonzeptionelle bzw. prenatale Geschlechtswahl verhindert werden. Ausserdem ist heute möglich eine transvaginale Ultraschalluntersuchung der Frucht. Diese Untersuchung kann eine Spaltmissbildung bereits zwischen der 12. bis 16. Woche der Schwangerschaft feststellen.

**Key words:** cleft lip, cleft palate, primary prevention, genetic risk, sex choice

All children in Bohemia with orofacial clefts are registered and treated at the Clinic of Plastic Surgery in Prague. The systematic registration

started in 1964, and the first results on the incidence of orofacial clefts in Bohemia have been published by Klásková (1974). The registration



has continued until now and yearly incidences of orofacial clefts oscillated around the mean value 1.74 per 1,000 of newborns during the last 29 years. The incidence of orofacial clefts did not exhibit an increasing trend in our country from 1964 to 1992 (Peterka et al., 1995).

Sex differences in the incidence of orofacial clefts are well known. There are 2,590 boys and only 1,967 girls (1.3 : 1.0, respectively) in the set of 4,557 children with orofacial clefts registered at the Clinic of Plastic Surgery in Prague during the last 29 years. There is a higher number of boys among children with cleft lip (CL) and cleft lip and palate (CLP): the boy/girl ratio is 1.9 : 1.0. On the other hand, girls are more likely to have cleft palates (CP); the boy/girl ratio is 1.0 : 1.4 (Peterka et al., 1995).

Anamnestic data on families with orofacial clefts is a prerequisite for the detection of possible causal genetic and environmental factors involved in the etiology of orofacial clefts, with aim of preventing a repetition of the malformation in the next pregnancy. Genetic factors (i.e., a positive family history) have been detected in only 18 % of our patients. In about 80 % of patients with orofacial clefts, the contribution of environmental factors (either a single strong factor or a combination of several weak factors: the factor complex) has been assumed (Peterka et al., 1985; Peterka, Fára, 1990; Peterka et al., 1994). Primary prevention of orofacial clefts for the next pregnancy is relatively easier in cases, where environmental factors (acute infection and higher body temperature, vitamin A, thalidomide, x-ray, rubeola etc.) have been suspected of inducing the malformation. Primary prevention is much more difficult when a genetic predisposition (positive family history) has been found. It is well known from literary data that at least two basic genetic groups - CL/P and CP - exist, each with different recurrent risks (Fog-Andersen, 1942; Bear, 1976; Bixler, 1981).

A group of affected children with positive family histories (i.e., one parent had some type of orofacial cleft) was selected from our register. No diagnostic bias was present, because the child and its parents were examined together. The aim of the present study was to demonstrate a relationship not only between a cleft type but also between the sex in the affected children and parents. On the basis of achieved results, the possibility of primary prevention focused on the next pregnancy was suggested.

## MATERIAL AND METHOD

Anamnestic data of the family history were collected at the Clinic of Plastic Surgery in Prague, where medical care is provided to all affected children born in Bohemia (Czech Republic). Children who never underwent examination because they died before they were old enough for

surgery were not included in the clinic register. We selected from the register 181 affected children whose mother or father (coefficient of kinship equals 1/2) had an orofacial cleft. Our analysis was performed according to the following scheme: mothers were sorted into 3 groups according to the type of cleft - cleft lip (CL), cleft lip and palate (CLP) or cleft palate (CP). The affected offspring of each of the 3 groups of mothers were also sorted according to cleft type and sex, and the respective frequencies were plotted in graphs. The same approach was applied to the fathers with CL, CLP or CP.

## RESULTS

Among offspring of mothers with CL, 12 % of boys and 16 % of girls were affected with the same cleft type (Fig. 1) and 16 % of girls and 56 % of boys were affected with CLP (Fig. 3). The higher percentage of boys with CLP was significant in comparison with the other groups. No children with CP have been registered.

The mothers with CLP delivered 64 % of boys and 15 % of girls with the same cleft type (Fig. 1). The frequency of children with CP or CL was never higher than 9%. The percentage of boys with CLP was significantly higher in comparison with other groups.

Mothers with CP had 51 % of girls and 37 % of boys with CP, but the difference was not significant (Fig. 1). The percentage of children with CL or CLP never rose above 10 %.

Among offspring of fathers with CL, 18 % of boys and 14 % of girls had CL (Fig. 2). A significant difference was found between the percentage of boys and girls with CLP - 45 % and 18 %, respectively (Fig. 3).

In the group of children whose fathers had CLP, no significant difference between the percentage of boys (43 %) and girls (40 %) with CLP

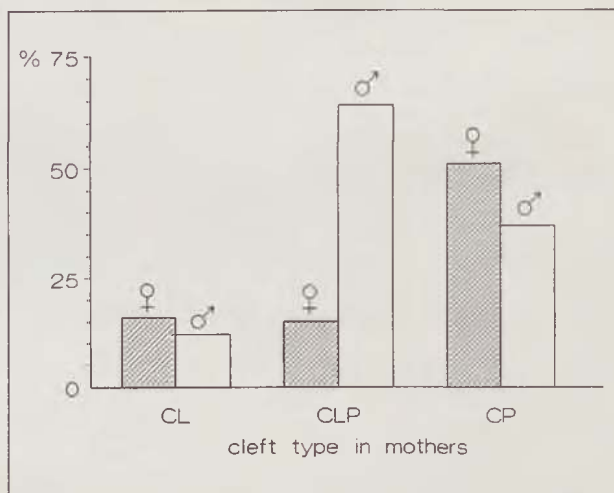


Fig. 1: Percentage of delivered boys and girls with CL, CLP and CP in mothers with the same type of cleft.



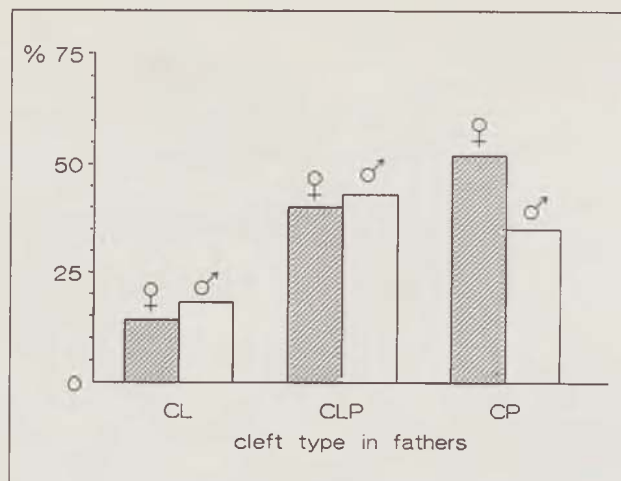


Fig. 2: Percentage of delivered boys and girls with CL, CLP and CP in fathers with the same type of cleft.

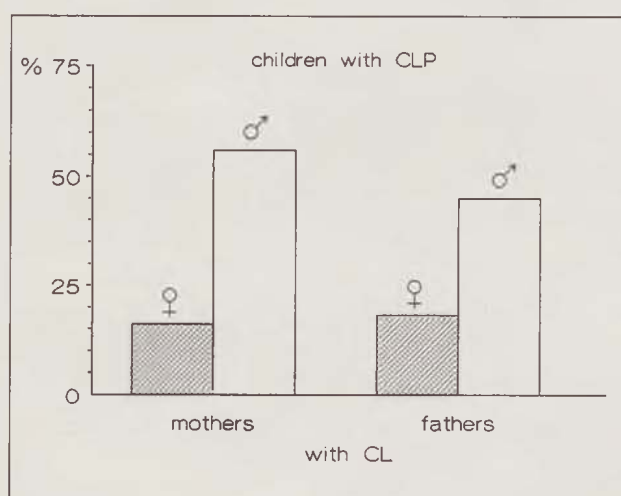


Fig. 3: Percentage of delivered boys and girls with CLP in parents with CL.

was found (Fig. 2). There was a very low percentage of both boys (9 %) and girls (9 %) with CL. No children with CP have been registered.

Among the offspring of fathers with CP, there was an insignificant prevalence of girls with CP (52 %) in comparison with boys with CP (35 %) (Fig. 2). The percentage of children with CL or CLP never rose above 9 %.

## DISCUSSION

We confirmed the existence of two basic familial genetic cleft types, apparent in both parents and their children: CL or CLP, and CP (Fogh-Andresen, 1942; Bixler, 1981). Different genes might be involved in the origin of clefts involving the lip (CL, CLP) and clefts where the lip is intact. This fact could be explained by different embryonic structures that have to be affected in different periods of embryonic development at the initia-

tion of CL or CLP versus CP. Cleft lip arises as a result of hypoplasia of the medial nasal and/or maxillary process during the first critical developmental period - approximately at embryonic day 27-35. Cleft palate originates later (during embryonic days 40-57), as a consequence of hypoplasia of the maxillary palatal processes and/or growth retardation of the mandible during the second and/or third critical developmental period, respectively. Normal growth of the mandible, which pulls away a of the tongue form the cranial base, is a prerequisite for the creation of sufficient space and consequent horizontalization of the palatal processes there (Jelínek, Peterka, 1977; Diewert, 1979). The palatal processes must be of normal size for contact and successful fusion after horizontalization (Peterka, Jelínek, 1978; Peterka, Jelínek, 1981; Fára et al., 1988).

Manifestation of both familial orofacial cleft types was sex-dependent. Among offspring of mothers with CL or CLP, the prevalence of boys with the same affliction is three times higher than in girls. A similar situation was also apparent among fathers with CL. However, a significant difference in the sex ratio disappeared in children of fathers with CLP, as a result of an increase of daughters affected by CLP. Among both mothers and fathers with CP, the prevalence of daughters was not significant. Among both mothers and fathers with CL, a significant prevalence of sons with CLP - more severe affliction - was seen.

The presented data suggest a possible means preventing cleft in families with positive family histories. If a mother has CL or CLP, or a father has CL, their daughters have a much larger chance of avoiding the cleft than the sons. If one parent has CP, chances of having a son without orofacial cleft should be a bit higher than in daughters. Therefore, preselection of the sex of the embryo should be made to decrease the genetic risk of repetition of the orofacial defect. At present, several ways are known.

In vitro techniques have been developed to separate X and Y sperms using the differential swimming abilities of the two types of sperm or using different speeds of migration in an electric field. The use of a selected sperm sample in artificial insemination may produce the desired sex.

Another possibility for choosing the sex of embryo has been described by Harlap (1979). The timing and management of sexual intercourse allows a couple to choose the sex of their child. A study of 3,668 births has revealed that the proportion of male births is higher when sexual intercourse occurs two or more days after ovulation than when it occurs at or near ovulation. The method of preconception selection of sex is underlied by differences in the features and behaviour of X and Y sperms and their responses to changes in the pH of the vaginal fluid. It has been reported that when intercourse occurs 3 - 5 days before ovulation, girls are born 82 - 85 % of the

fine and when intercourse occurs 1 day before and 2 days after ovulation, boys are born in 84 - 87 % of the fine (Presl, 1982).

At present, it is possible to use transvaginal sonography for detection of cleft lip. Brohstein et al. (1994) described ultrasound examinations conducted for fetal malformations between 12 - 16 weeks of gestation. Detection of cleft lip by transvaginal sonography provides parents important information on deciding whether to continue or artificially terminate the pregnancy.

By combining the preconception choice of the sex of the baby with the ultrasonography method for prenatal screening of malformations, the risk of delivering a child with an orofacial cleft in families with a genetic predisposition should be decreased.

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# LONG TIME FOLLOW-UP OF FLEXOR TENDONS OF THE HAND AFTER RECONSTRUCTIVE OPERATIONS

## Part 1: MONITORING METHOD

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### SUMMARY

Monitoring method for patients who undertook the reconstructive operation of flexor tendons of the hand is described. Pre-operative condition, operation finding, surgery execution, post-operative condition, rehabilitation as well as the situation during the graduated checks up after 6 and 9 months; 2, 6 and 10 years were noted down into standart forms.

### ZUSAMMENFASSUNG

#### Langzeitige Verfolgung nach der chirurgischen Rekonstruktion der Flexorsehne der Hand. Teil 1: Monitorierungsmethode

V. Smrčka, J. Samohýl, P. Holuša

Die Monitorierungsmethode für Patienten, die sich der rekonstruierenden Operation an der Flexorsehne der Hand unterzogen, wird beschrieben. Der Zustand vor der Operation, der Operationsbefund, das chirurgische Verfahren, der postoperative Zustand, die Rehabilitation und auch die Situation während der allmählichen Kontrolluntersuchungen nach 6 und 9 Monaten, 2, 6 und 10 Jahren wurde in eine Standardform zusammengefasst.

**Key words:** hand, flexor tendons, computer monitoring

The objective of our study was to find how the impairments and operations affect the flexor tendons of the hand in graduated intervals after the operations.

We have evaluated above all the reconstructive interventions such as tenolyses, re-suturing, re-insertions, transpositions of the superficial flexor since prior to a scheduled operation there can be measured the extent of the movement of the finger to be operated.

The clinical material has been divided in two groups, one of 24 patients and the other one of 59 patients. We have been investigating the first group specialized in tenolysis of flexors, risk of ruptures and reconstruction of pulleys from 1981 to 1982 (Smrčka, Kopřivová 1984), the investigation of the second one dealing with majority of the secondary operations was carried out between 1981 and 1986 (Smrčka et al. 1988, 1989, 1995). All material was evaluated after 10 years. Considering the whole issue which is rather compli-

cated it is evident that there are many factors acting at the same time. It proved necessary to use computerized approach.

For the purpose of computerized processing we have elaborated a standard series of questionnaires, each being filled in only by two persons.

**Form 1 (RECORD)** serves in fact as a history record.

**Form 2 (PREOP)** is a record of pre-operative state with the history of the injury, sensitivity, extent of movement, existence of healed fractures, if any.

**Form 3 (PEROP)** - is a description of operation field including lesions of digital nerves and arteries, interrupted tendon pulleys, lesions of tendon sheaths, impairment of tendons, localization of adhesions.

**Form 4 (SURG)** - is a description of operation intervention on the flexor tendon with localization of the place as well as according to the international classification of zones. At the same

### Form 1: Records

Number of clinical picture: .....  
 Name and surname: .....  
 Citizens' card-index number: .....  
 Place: ..... Street number: .....  
 Post-district number: .....  
 Sex: ..... Date of birth: ..... Date of examination: .....  
 Finger with injury: ..... Hand: .....  
 Hospitalization - from: ..... to: .....  
 In out-patients' clinic: .....  
 Diagnosis - principal: .....  
  
 Diagnosis - additional: .....

### Form 2: Preoperative state

Date of accident: ..... Place: .....  
 Caused by instrument: ..... Nature of wound: .....  
 Wound-1st fing. - phal.: ..... 2nd fing. - phal.: ..... 3rd fing. phal.: .....  
 4th fing. - phal.: ..... 5th fing. phal.: .....  
 Flexor profundus injured in the finger: .....  
 Wound: ..... Skin loss: .....  
 Insensible-palm: ..... Finger 1st phal. - U: ..... 1st phal. - R: .....  
 2nd phal. - U: ..... 2nd phal. - R: .....  
 3rd phal. - U: ..... 3rd phal. - R: .....  
 Normal sensibility: .....  
 Finger with motion failure  
 flexion F-MP: ..... Extension lag E-MP: ..... Range R-MP: .....  
 (F) F-PIP: ..... (E) E-PIP: ..... (R) R-PIP: .....  
 F-DIP: ..... E-DIP: ..... R-DIP: .....  
 Standard motions-Pinch: ..... Fist: ..... Motion fail. also of finger: .....  
 Bowstring: ..... Phalanx: ..... Passes over MP to palm: .....  
 Fracture acc. to X-ray picture: ..... Metacarpals: .....  
 1st finger-joints: ..... 1st phalanxes: .....  
 2nd finger-joints: ..... 2nd phalanxes: .....  
 3rd finger-joints: ..... 3rd phalanxes: .....  
 4th finger-joints: ..... 4th phalanxes: .....  
 5th finger-joints: ..... 5th phalanxes: .....  
 Conservative therapy (weeks): ..... Osteosynthesis: ..... Time (months): .....  
 Osteosynthesis removed (date): ..... Up-today: .....  
 Skin coverage-defects of the coverage: ..... Scars: .....  
 Graft: ..... Flaps: .....  
 Notes: U - ulnar part  
 R - radial part  
 MP - metacarpophalangeal joint  
 PIP - proximal interphalangeal joint  
 DIP - distal interphalangeal joint



### Form 3: Perioperative state

Operation: ..... From injury to operation  
 hours: ..... weeks: ..... months: ..... years: .....  
 Incision: ..... Anesthesia: ..... Bloodlessness: .....  
 Digital nerve: ..... 1st phal.: ..... 2nd phal.: ..... 3rd phal.: .....  
 Loss (mm) ..... L1st phal.: ..... L2nd phal.: ..... L3rd phal.: .....  
 In adhesion (A): ..... A1st phal.: ..... A2nd phal.: ..... A3rd phal.: .....  
 Neuroma (N): ..... N1st phal.: ..... N2nd phal.: ..... N3rd phal.: .....  
 Of major nerves injured: ..... Place: .....  
 Digital artery (interrupted): ..... Phal.: ..... Uln.: ..... Rad.: .....  
 Palm artery arch interrupted: .....  
 Joint open: ..... Capsula defect: ..... Articular surf. damaged: .....  
 Part of head missing: ..... The whole head missing: .....  
 Pulleys interrupted: .....  
 Tendon sheath defect in the length of (mm): SD1 phal.: ..... SD2 phal.: ..... SD3 phal.: .....  
 Tendon-interrupted: .....  
 S-flexor (place): ..... S - zone: ..... P - flexor (place): ..... P - zone: .....  
 Retraction: TS - flexor (cm): ..... to the place: ..... TS - zone: .....  
 TP - flexor (cm): ..... to the place: ..... TP - zone: .....  
 Loss (L): ..... LS - flexor (cm): ..... LP - flexor (cm): .....  
 Adhesion to the base (AB): ..... AB - zone: .....  
 Adhesion to surroundings (AS): ..... AS - zone: .....  
 Condition: ..... Shred to fibres (S): ..... SS - zone: ..... SP - zone: .....

### Form 4: Surgery

Operation (date): ..... Surgeon: .....  
 Flap (F): ..... F - covers: .....  
 Medium thick graft (GM): ..... GM - covers: .....  
 Fully thick graft (GF): ..... GF - covers: .....  
 Digital nerve: ..... Nerve taken from: .....  
 Pulley reconstructed: ..... Which one: .....  
 Tendon: Extirpation: ..... Reinsertion: ..... Where: .....  
 Resuture (RS): ..... RSS - zone: ..... RSP - zone: .....  
 RSS - place: ..... RSP - place: .....  
 Suture (SU): ..... SUS - zone: ..... SUP - zone: .....  
 SUS - place: ..... SUP - place: .....  
 Type of suture: .....  
 Tenolysis: ..... Extent (mm): ..... Zone: ..... Place: .....  
 Transposition: ..... From finger: ..... Insertion: .....  
 Replacement: ..... Taken form: .....  
 Other method: .....  
 Material for suture of tendons: ..... For fixating sutures: .....  
 Joints-capsula suture: ..... Arthrodesis: ..... Redressing: .....  
 Bones-removal of exostosis - MTCP: .....  
 ATB -into the wound: ..... Kind: .....

### Form 5: Postoperative state

Complication after operation: .....

Dehiscence (D): ..... D-postoperative day: ..... D-where: .....  
 Haematoma (H): ..... H-postoperative day: ..... H-where: .....  
 Swelling (SW): ..... SW-postoperative day: ..... SW-where: .....  
 Inflammation in wound (W): ..... I-postoperative day: ..... I-where: .....  
 Microbe (from smear): .....  
 ATB (sensitivity): .....  
 Fever: ..... When: ..... How long (days): .....  
 Antibiotic per oral and parenteral: .....  
 Which one: ..... dosis / day: ..... For period (days): .....  
 Occupation: ..... Restart of work (date): .....  
 Grasping difficulties: ..... The finger hinders in the work: .....  
 Patient does not work: .....

### Form 6: Rehabilitation

Range of finger motion  
 Beginning (B) of RH-MP: ..... B-PIP: ..... B-DIP: .....  
 End (E) of RH-MP: ..... E-PIP: ..... E-DIP: .....  
 Rehabilitation began:  
 after hours (within 72 hours): ..... after days: ..... after weeks: .....  
 Exercises (after days): .....  
 Active: ..... Active with assistance: ..... Passive: .....  
 Fixation of finger in palm: .....  
 F-start (date): ..... F-effect (after days): .....  
 Drawing out contractures (DC)  
 Passively: ..... DC-start (date): ..... DC-effect (after days): .....  
 By a splint (ST): ..... ST-start (date): ..... ST-effect (after days): .....  
 Physiotherapy    Ultrasound (US): ..... US-how many times: ..... Dosis: .....  
                     Diadynamic (DI): ..... DI-how many times: ..... Type: .....  
 Complication during rehabilitation  
 Tendovaginitis (T): ..... Where: ..... T-start (date): .....  
 T-duration (days): ..... Weeks: ..... T-therapy: .....  
 Osteoporosis (O): ..... Bones: ..... Joints: .....  
 O-start (days): ..... O-duration (days): ..... Weeks: .....  
 O-therapy: .....  
 Dehiscence of cover: ..... Where: ..... D-start (date): .....  
 Exercise interrupted: ..... For the period (days): .....

time there has been also determined intervention on the phalanges and finger joints. When a defect of skin cover is present, it is stated what place is covered with a flap or a graft.

**Form 5 (POOP)** is the questionnaire dealing with postoperative history and complications, antibiotic therapy and the date of the patient's being back to work.

**Form 6 (REHAB)** is a description of rehabilitation, its beginning and the end. What methods of rehabilitation treatment were used. Simultaneously it is the record of complications which could slow down the rehabilitation exercises.

Check questionnaire (**Form 7 - CHECK**) is to be filled in after 6, 9 months; 2, 6 and 10 years after operation.

Form 7: State at the check-up

Date of examination: ..... Check No.: .....  
 Since operation-months: ..... years: .....  
 Scars: .....  
 Bowstring: ..... Beginnig (weeks after oper.): ..... Where: .....  
 Over MP joint to palm: .....  
 Normal sensibility: .....  
 Palm insensible: ..... Finger ULN: .....  
 Finger RAD: .....  
 Sensibility disorders: ..... Palm: ..... Phalanx: ..... U: ..... R: .....  
 Contralateral (normal) finger (N)  
 flexion NF-MP: ..... Extension lag NE-MP: ..... Range NR-MP: .....  
 (F) NF-PIP: ..... (E) NE-PIP: ..... (R) NR-PIP: .....  
 NF-DIP: ..... NE-DIP: ..... NR-DIP: .....  
 Finger with motion failure (after operation) (F)  
 flexion FF-MP: ..... Extension lag FE-MP: ..... Range FR-MP: .....  
 (F) FF-PIP: ..... (E) FE-PIP: ..... (R) FR-PIP: .....  
 FF-DIP: ..... FE-DIP: ..... FR-DIP: .....  
 Standard motions - Pinch: ..... Fist: .....  
 Loss of motion (by rupture of tendon or pulley): ..... Date: .....  
 in all joints: ..... only in the joint: .....  
 Motion recovered (RD): ..... in RD-MP: ..... RD-PIP: ..... RD-DIP: .....

Form 8: Anthropometry

Occupation: ..... Age: ..... Number of operations: .....  
 Last operation: .....  
 Arm circumference (cm) (AC) AC-right: ..... AC-left: .....  
 Arm circumference (cm)-fist closed (AF) AF-right: ..... AF-left: .....  
 Forearm circumference (cm) (FC) FC-right: ..... FC-left: .....  
 Forearm circumference (cm) - fist closed (FCF) FCF-right: ..... FCF-left: .....  
 Length of hand (cm) (HL) HL-right: ..... HL-left: .....  
 Width of hand (cm) (HW) HW-right: ..... HW-left: .....  
 Width of first phalanx (mm) (FW-2DX)  
 FW-1DX: ..... FW-2DX: ..... FW-3DX: ..... FW-4DX: ..... FW-5DX: .....  
 FW-1SIN: ..... FW-2SIN: ..... FW-3SIN: ..... FW-4SIN: ..... FW-5SIN: .....  
 Distance finger pulp - distal palmar crease (DCP) (cm): .....  
 Dominant hand: .....

The record of angles of joints - the extent of movement of the injured finger as compared to the corresponding finger of the other hand is its most important part.

After the operation are taken anthropometric measurements (**Form 8 - ANTHR**) with the following values : arm circumference, forearm circumference both at rest and at movement, width of the hand and the basic phalanges.

The results (**Form 9 - RESULT**) obtained in each patient is evaluated according to various international classifications TAM, Buck-Gramcko and Strickland - Glovac. At the same time we have calculated the percentage of improvement per each operation.

Our objective was to evaluate the operational methods of all basic flexor tendon operations of the hand and in accordance with the result to adapt gradually the operational tactics.



# Form 9: Results

## Contralateral finger (N)

flexion NF-MP: ..... Extension lag NE-MP: ..... Range NR-MP: .....  
 (F) NF-PIP: ..... (E) NE-PIP: ..... (R) NR-PIP: .....  
 NF-DIP: ..... NE-DIP: ..... NR-DIP: .....

## Finger with motion failure (before operation)

flexion F-MP: ..... Extension lag E-MP: ..... Range R-MP: .....  
 (F) F-PIP: ..... (E) E-PIP: ..... (R) R-PIP: .....  
 F-DIP: ..... E-DIP: ..... R-DIP: .....

## Finger with motion failure (after operation)

flexion FF-MP: ..... Extension lag FF-MP: ..... Range FR-MP: .....  
 (F) FF-PIP: ..... (E) FE-PIP: ..... (R) FR-PIP: .....  
 FF-DIP: ..... FE-DIP: ..... FR-DIP: .....

Distance finger pulp - distal palmar crease (DCP) (cm): .....

## Classification

Operation-name	TAM	% of improvement	Buck-Gramcko	Strickland-Glovac
01: .....	T1: .....	I1: .....	B1: .....	S1: .....
02: .....	T2: .....	I2: .....	B2: .....	S2: .....
03: .....	T3: .....	I3: .....	B3: .....	S3: .....
04: .....	T4: .....	I4: .....	B4: .....	S4: .....

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## RANGES OF JOINT MOTION OF THE ADULT HAND

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### SUMMARY

Norms of the motion of the joints of the adult hand are presented. Examined were 100 males and 100 females aged 20-25 years. All of them were university students in whom the hand was not affected by work or other one-sided activities and so its motion could be considered as the optimal (lefthanded students were not included in this series). The passive and active flexions and hyperextensions were measured in all fingers of both hands as well as in the wrist. In the latter were measured in addition both active ductions. The results may serve for an assessment of deviations in joint motion of the hand in inborn malformations and other diseases, sequelae of injuries, during rehabilitation and evaluation of the effect of working and other manual activities etc. Differences in motion of the individual joints of the same type and differences between the right and the left side and both sexes were assessed as well.

### ZUSAMMENFASSUNG

#### Bewegungsumfang der Gelenke einer erwachsenen Hand

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Es werden Normen der Gelenksbewegungen einer gesunden Hand bei Erwachsenen vorgelegt. Das Untersuchungsgut umfasste 100 Männer und 100 Frauen im Alter von 20 bis 25 Jahren. Es handelte sich um Studenten der Hochschulen, bei denen die Hand durch keine manuelle Arbeit oder durch eine andere einseitige Belastung beeinflusst wird. Die Beweglichkeit kann als optimal bezeichnet werden (die Linkshändigen wurden nicht eingeschlossen). An allen Fingern und an den Handwurzeln beider Hände erfolgten Messungen der aktiven und passiven Flexion und der Hyperextension und an der Handwurzel durch beide aktiven Duktionen. Die Ergebnisse können zu einer Beurteilung der Abweichungen der Beweglichkeit der Hand bei angeborenen Missbildungen und anderen Erkrankungen, nach Verletzungen während der Rehabilitation, bei der Bewertung der Einwirkung der Arbeitsbelastung, dienen. Es wurden durch die Unterschiede zwischen der Beweglichkeit einzelner Gelenke von dem selben Typ und die Unterschiede zwischen der rechten und linken Seite und zwischen den beiden Geschlechtern bestimmt.

**Key words:** joint motion, adult hand, norms

Normal values of the range of motion of hand joints reported in the literature (Bunnell 1948, Batch 1955, Hněvkovský and Poláková 1955, Janda 1957, Litter 1960, Schnelle 1964 and others) are usually obtained on small series and provide only basic information about individual hand joint motion. Often, they differ and therefore can be used only for basic assessment. The studies providing objective norms of joint motion based on sufficiently large series of population are uncommon (Šmahel 1969). No doubt, this is a result of the time consuming and difficult measurement of numerous small joint movements of the hand in a larger number of probands with special goniometers. Even less available is examination of a

large number of probands performed with special equipment with electronic measurements.

In spite of these difficulties exactly determined norms of joint motion are very important for many medical disciplines, in the objective classification of joint motion limitation, results of surgery, rehabilitation procedure, the effect of work and other activities on joint motion of the hand etc. These norms must respect the age, intersexual and side differences. Differentiation of the passive and active movements is of importance for clinical practice as well as for research.

With regard to the above mentioned requirements the aim of this study was to provide the norms of joint motion of the adult hand which

was not influenced by manual work or other one-sided activities.

## MATERIAL AND METHOD

100 normal males and 100 females aged 20 - 25 years were examined. All of them were university students with supposed minimum effect of working activity on joint motion. Into this series were not included lefthanded, active sportsmen, musicians and individuals after hand injury. We consider joint motion of the hand in these probands as optimum. Therefore the measured values can be used as norms for the adult general population. A larger number of probands in both groups compensate for the smaller accuracy of angle measurements.



Fig. 1: Measurement of passive hyperextension in the first MP joint.



Fig. 2: Measurement of active flexion in the metacarpophalangeal joint of the thumb.



Fig. 3: Measurement of the wrist active hyperextension.



Fig. 4: Measurement of the wrist active abduction.

62 characteristics were measured on each hand. All dorsovolar movements were measured with a metallic slide goniometer (Figs. 1 - 2), the short arms of which are placed on the dorsal side above the respective joint. The range of movement is transferred to the central calibrated arm. The two short arms can be prolonged and used for the measurement of the dorsovolar excursion of the large wrist joint (Fig. 3).

During the examination we observed the general principles for angles measurement (Hněvkovský and Poláková, 1955). During the measurement of hyperextension in the metacarpophalangeal (MP) joint the hand is placed with the palm on the table with maximally lifted fingers. During flexion it is in a position between pronation and supination and the fingers are flexed in the basal and middle joints, yet the terminal joints remain extended when it is possible to reach the maximal MP flexion. During examination of flexion of the middle (PIP) and terminal (DIP) interphalangeal joints, the fingers form a hook, during extension they are stretched or possibly bent into recurvation. We measure similarly the motion of the metacarpophalangeal (MPP) and interphalangeal (IPP) joints of the thumb during their maximum flexion into the palm or their hyperextension. During the measurement of



dorsovolar movements of the wrist with the hand in pronate position the goniometer is placed upon the forearm and the third metacarpus. During hyperextension the hand with the extended fingers is lifted from the plate as much as possible. In flexion the fingers are bent. At first, we always ascertain the active movement and then in the same position uniform pressure is applied upon the relaxed fingers so that the proband does not feel pain (passive movements). With such a procedure the active movement is not influenced by previous manipulation with the hand by the investigator. However, the probands gently exercise their hands before the examination.

In the wrist in addition to dorsovolar movements were studied also active radioulnar ductions. During the measurement one arm of the goniometer is placed on the volar side of the forearm, the second arm overlies or lies in parallel with the axis of the third metacarpal bone (Fig. 4).

For the numerical recording of dorsovolar motion we used the system of a full circle where the plane containing the outstretched fingers is marked as 180°. Extension or hyperextension is characterized by higher values, however, the flexion is expressed by lower values. The larger the flexion the lower are the numerical data. We can convert the value into a system where the level of extension of the fingers is expressed as 0°. This system is less suitable for fingers (at incomplete movements this is complicated by negative values). But it was used for the recording of abduction and adduction of the wrist.

From the measured data were calculated the basic statistic characteristics and the intersexual differences were tested with two-sided t-test. In the tables are not presented values of hyperextension of the interphalangeal joints of the threephalangeal fingers which are of little practical use.

## RESULTS

The results are summed up in Tables 1 - 5. As they are supposed to be used primarily as norms in the clinical practice they will be described in short. Active hyperextension (Tab. 1) in the MP joints is in all fingers significantly larger in females than in males. At the same time with the exception of the little finger in females it is larger in the right than in the left hand. Passive hyperextension is larger in females only on the right hand while on the left larger values were recorded in males.

In three-phalangeal fingers the highest flexion (active and passive; Tabs. 2, 3) is present in PIP joints, followed by MP joints and in males with some difference by DIP joints. The difference between flexion of MP and DIP joints in females is visibly smaller than in males, in the little fin-

ger and the forefinger on the right side, there was on the contrary a higher flexion of DIP joints. The flexion of the MP joints show mostly only little differences between the right and left side and significant intersexual difference in favour of a larger flexion in males were recorded only in some joints (Tabs. 2, 3). The passive flexion in PIP joints is mostly (active flexion exceptionally) larger in females than in males. The differences between the right and the left side are small in females, in males there is a visible tendency for greater flexion on the left side. In all DIP joints active as well as passive flexion is significantly larger in females than in males, the differences between the right and left side are small but for some exceptions.

In the thumb slight hyperextensions are common, larger in IPP than in the MPP joint (Tab. 4). In the MPP joint the passive as well as the active hyperextensions are larger in females and on the left. In IPP joints the intersexual differences are small (but for one exception - active hyperextension on the right) and the right-left differences are irregular. The flexions in MPP joint are usually larger in females than males, in IPP joints the differences are unimportant. The right-left differences are usually small, in the IPP joint there is a slightly larger flexion on the left.

All movements in the wrist (Tab. 5) but for adduction are larger in females than males, adduction is identical in both sexes. Right-left differences were not recorded anywhere, only the passive flexion on the left was a little larger.

Table 1: Mean values and standard deviations (in brackets) of passive and active hyperextensions of metacarpophalangeal joints in adults.

passive	right	left
II. M	232.0 (6.1) xx	237.0 (8.0)
F	235.8 (10.9)	236.7 (10.4)
III. M	224.8 (7.6)	231.0 (6.8)
F	227.0 (10.7)	229.6 (11.2)
IV. M	225.6 (6.3) xx	230.8 (6.8)
F	228.8 (9.9)	228.6 (10.7)
V. M	238.0 (8.9) xxx	247.9 (6.5) xxx
F	247.1 (10.4)	243.3 (13.7)
active		
II. M	201.0 (6.6) xxx	206.3 (6.7) xx
F	207.3 (6.1)	208.9 (5.9)
III. M	198.6 (6.8) xx	202.7 (5.8) xxx
F	201.5 (6.1)	205.6 (6.0)
IV. M	198.0 (5.9) xx	202.3 (7.2) xx
F	200.8 (6.1)	205.2 (6.6)
V. M	206.6 (7.0) xxx	211.9 (5.9) xxx
F	218.6 (7.2)	217.4 (11.3)

x = significant difference between males and females at  $p < 0.05$

xx =  $p < 0.01$  xxx =  $p < 0.001$

Table 2: Mean values and standard deviations (in brackets) of active flexion of three-phalangeal finger joints in adults.

MP	right	left
II. M	90.4 (5.2) xxx	92.4 (5.5)
F	95.5 (9.7)	93.2 (6.4)
III. M	87.3 (5.1)	88.1 (5.2)
F	85.9 (8.2)	86.6 (5.6)
IV. M	84.9 (4.4) xxx	85.6 (4.4) xxx
F	93.3 (8.3)	91.6 (7.4)
V. M	82.8 (5.0) xxx	83.8 (5.2) xxx
F	88.8 (7.1)	93.2 (7.1)
PIP		
II. M	72.9 (5.5) x	68.2 (5.3)
F	71.3 (5.9)	68.4 (7.2)
III. M	72.7 (5.1)	69.0 (4.8) x
F	72.0 (6.2)	70.7 (6.0)
IV. M	73.6 (4.9) xxx	69.2 (5.2)
F	68.3 (5.0)	68.2 (5.9)
V. M	80.2 (5.0) xxx	75.4 (6.0) x
F	75.4 (5.6)	77.6 (6.0)
DIP		
II. M	98.4 (7.1) xxx	100.4 (8.4) xxx
F	90.2 (5.7)	95.4 (6.2)
III. M	98.3 (7.6) xxx	99.6 (8.4) xxx
F	90.8 (6.7)	88.4 (6.7)
IV. M	104.0 (8.8) xxx	105.0 (9.3) xxx
F	95.5 (12.7)	98.4 (8.3)
V. M	94.4 (7.2) xxx	98.2 (8.7) xxx
F	85.7 (8.1)	85.9 (6.3)

x = significant difference between males and females  
at  $p < 0.05$   
xx =  $p < 0.01$  xxx =  $p < 0.001$

Table 3: Mean values and standard deviations (in brackets) of passive flexion of three-phalangeal finger joints in adults.

MP	right	left
II. M	83.9 (4.7)	81.5 (5.3) xx
F	82.8 (7.6)	84.0 (6.2)
III. M	78.8 (5.1) xxx	76.8 (5.2)
F	74.5 (7.0)	77.0 (6.0)
IV. M	77.2 (4.6)	74.8 (5.4) xxx
F	77.7 (6.0)	79.2 (6.1)
V. M	75.0 (4.7)	71.9 (5.4) xxx
F	75.7 (6.8)	77.8 (8.0)
PIP		
II. M	66.0 (4.5) xxx	63.6 (4.7)
F	62.8 (4.9)	63.0 (6.1)
III. M	66.0 (4.5) xxx	64.0 (4.2) xx
F	61.6 (4.8)	62.2 (5.4)
IV. M	66.6 (4.5) xxx	64.2 (5.1) xxx
F	61.0 (4.7)	61.0 (4.7)
V. M	70.9 (5.7) xxx	68.2 (6.1)
F	65.9 (5.0)	68.6 (5.8)
DIP		
II. M	93.6 (5.6) xxx	92.5 (5.7) xxx
F	82.6 (6.0)	88.0 (5.7)
III. M	93.1 (6.0) xxx	92.5 (5.2) xxx
F	82.2 (6.4)	81.3 (6.5)
IV. M	97.6 (8.0) xxx	96.0 (6.9) xxx
F	87.4 (6.6)	89.7 (7.1)
V. M	90.9 (5.7) xxx	91.3 (5.5) xxx
F	76.9 (6.6)	78.5 (5.8)

x = significant difference between males and females  
at  $p < 0.05$   
xx =  $p < 0.01$  xxx =  $p < 0.001$

Table 4: Mean values and standard deviations (in brackets) of passive and active extensions and flexions of thumb joints in adults.

pas. ext.	right	left
MPP M	195.8 (9.6) xxx	205.4 (11.8)
F	203.0 (10.8)	206.0 (11.5)
IPP M	217.6 (12.0)	212.9 (12.3)
F	214.4 (13.8)	213.9 (14.9)
act. ext.		
MPP M	189.0 (7.5) xx	193.9 (13.0) xx
F	193.0 (11.2)	199.0 (10.3)
IPP M	208.6 (13.0) xxx	203.5 (12.7)
F	196.2 (13.8)	204.6 (13.8)
act. flex.		
MPP M	127.6 (9.7) xxx	126.7 (10.2) xxx
F	116.2 (13.2)	121.6 (9.8)
IPP M	103.7 (8.4)	98.2 (9.9)
F	101.8 (7.3)	100.0 (9.1)
pas. flex.		
MPP M	117.2 (8.6) xxx	118.2 (8.6) xxx
F	108.8 (10.1)	108.0 (8.8)
IPP M	97.0 (7.6)	93.0 (8.6)
F	94.8 (9.3)	92.2 (7.8)

x = significant difference between males and females  
at  $p < 0.05$   
xx =  $p < 0.01$  xxx =  $p < 0.001$

Table 5: Mean values and standard deviations (in brackets) of individual movements of the wrist in adults.

	right	left
passive extension M	246.2 (7.6) xxx	247.3 (7.4) xxx
F	263.4 (8.4)	263.9 (8.8)
active extension M	235.2 (8.6) xxx	235.9 (8.8) xxx
F	251.8 (8.8)	252.2 (9.8)
active flexion M	118.1 (5.7) xxx	116.2 (5.8) xxx
F	109.3 (6.0)	109.2 (6.9)
passive flexion M	109.4 (5.6) xxx	106.4 (6.3) xxx
F	100.0 (5.9)	98.3 (7.6)
active abduction M	15.7 (3.3) xxx	15.4 (2.9) xxx
F	19.1 (4.2)	19.9 (5.6)
active adduction M	49.4 (4.8)	48.8 (4.7)
F	48.7 (6.3)	48.6 (6.4)

x = significant difference between males and females  
at  $p < 0.05$   
xx =  $p < 0.01$  xxx =  $p < 0.001$

## DISCUSSION

The presented data may serve as norms for an assesment of deviations of joint motion in inborn malformations and other diseases, in sequelae of injuries, rehabilitation of the hand, in evaluation of the effects of work and other activities etc. As normal or optimum can be considered movements within a range of two standard deviations from the recorded mean values. In individual assesment for instance of working disability it is of course necessary to respect the importance of the individual joints for the hand functions. In three-phalangeal fingers are the most important MP joints, since their stiffness reduces the fingers motion by 68 % of the functionnally important range and hinders their duction (Klement, 1956). In PIP joints the limitation is smaller -



37 %, in the DIP joints limitation is as little as 12 % (of course the stiffening in the terminal position is more severe than in the middle position). In the thumb joints, from the functional view, the MPP is rather more important the IPP joint even though it is less mobile (Swanson, 1964). But the most important joint is the carpometacarpal joint which allows the opposition. The thumb is the most important finger and its loss is usually assessed as 40 % disability.

The results showed that besides intersexual and side differences there are regularly differences between the motion of individual joints of the same type. In the MP joints the passive and the active hyperextensions are the largest in the little finger, smaller in the forefinger and the smallest in both inner fingers. The active and passive flexion increases in the ulnar direction, with the exception of the middle finger in girls, which attains the greatest flexion. In the PIP joints both flexions are the smallest in the little finger, in the other three fingers there is no apparent difference. In the DIP joints flexions are the smallest in the ringfinger and largest in the little finger. The smallest flexion in MP joints is in the forefinger, in PIP in the little finger and in DIP in the ringfinger. The range of the active motion of MP and PIP joints is approximately identical, but in the PIP joints the whole range is shifted into the flexion area. The range of passive motion in MP joints is due to larger hyperextension, larger than in PIP joints. The smallest range of passive motion is always in DIP joints.

The active and passive flexion and hyperextension of the thumb are always larger in the interphalangeal than in the metacarpophalangeal joint. Both the passive and active motion of the wrist in the volar and dorsal direction is identical in females while in males the flexion is slightly larger than hyperextension. Adduction of the wrist in the supine position of the hand is (in girls 2.5 times, in boys 3 times) greater than abduction. The difference is due to abduction.

The summing up of intersexual differences shows that but for adduction the wrist is more mobile in females than in males. In the three-phalangeal fingers flexions in PIP and DIP and hyperextensions in MP joints are rather larger in females. However flexion in MP joints is irregularly larger in males. In general there is a slight trend towards a higher mobility of the hand in females. In MPP joints intersexual differences are small. The right-left differences in the majority of joints of the hand are small, only some types of movements indicate greater values on the left (hyperextensions in MP joints, PIP flexions in males, hyperextensions in MPP and flexions in IPP joints).

We failed to discover in the available literature any study of similar type but for Šmahel's re-

port (1969) on children aged 6 - 16 years. In relation to the age group 14 -16 years of the above mentioned study, we have noted the following differences: in adults in MP joints the hyperextension is smaller but for little finger where it is larger, the flexion in MP and DIP joints is larger, flexion in PIP joints is approximately identical (except for the little finger where it is larger); both thumb joints show smaller flexions, but for MPP flexion in females which is identical; the flexion on the wrist is smaller in both sexes, this holds true also for the extension in males, which in females is on the contrary greater; the abduction in both sexes is greater, the adduction is identical. The differences could be due to more solid construction of the adult joint which preferably limits the passive and less needed movements (hyperextension of MP, perhaps also unused thumb flexion). However greater strength can at a certain age contribute to an increase of some movements (MP and DIP flexion). The limitation of motion of the wrist with age can be expected, the increase of abduction can be related to a higher muscle strength, the increase of extension of the wrist in females to a less solid structure of the joint with age as compared to males.

The results can of course be influenced by a different aim of probands to attain the maximum motion and by the energetic approach of the investigator. Because of the subtle body construction in females we can expect a larger joint motion as it was confirmed by our results. A superior joint motion of the wrist in females is reported e.g. by Brumfield et. al (1966). This relationship can be slighter between the right and left side. Our findings did not exclude this option. There are only a few reports based on larger scale research. Thus further studies are needed.

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## DO-NOT-RESUSCITATE ORDERS AND WITHHELD OR WITHDRAWN TREATMENT

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### SUMMARY

Advances in medicine have brought immense possibilities in therapy but at a price including tremendous financial costs and also protracted human suffering.

Cardiopulmonary resuscitation (CPR) is an emergency procedure in patients with cardiopulmonary arrest. Outcome of the CPR depends upon the character and severity of the afflicting disease, upon the patient's condition before cardiopulmonary arrest and upon the response to therapy. CPR is instituted by emergency medical technicians automatically even in terminal condition of patients. Various models for prognostic prediction may confirm early decision about relevance of continuing treatment and writing a „DO-NOT-RESUSCITATE“ order or withdrawing treatment. Numerous studies pointed out two exceptions, when CPR is not started and when the aggressive therapy is withdrawn - DNR order is written in the patient's medical record: 1. on the basis of autonomy the patient may not consent with CPR in advance or when he is incompetent, the family or surrogate decide to withdraw treatment; 2. physician is not obliged to provide diagnostic or therapeutical interventions (not even when requested by the family), when these acts are futile. The meaning of futility may be understood in a different way, but always the ethical principles must be considered: beneficence, maleficence, social justice and autonomy of the patient.

In burn medicine, there are different factors encouraging the DNR orders, withheld and withdrawn treatment. This dilemma might be decided only by an interdisciplinary conference.

### ZUAMMENFASSUNG

#### Keine Reanimation Austrag und nichtgebotene oder zurückgewichene Therapie

R. Königová

Vorschritte der Medizin brachten nicht nur unermessliche Behandlungsverfahren, sondern auch unermessliche Finanzkosten und auch Verlängerung des menschlichen Leidens. Die kardiopulmonale Resusitzation (KPR) ist ein unaufschiebbarer routinärer Eingriff bei Patienten mit kardiopulmonalem Stillstand. Das Ergebnis der KPR hängt von Charakter und Gefährlichkeit der Krankheit und von Gesundheitszustand des Patienten vor dem Stillstand und seiner Antwort auf die Behandlung ab. Die Einleitung der KPR ist die sämtliche Pflicht für alle Angestellten des Gesundheitswesens und zwar auch bei Patienten im terminalen Zustand und allgemeiner schlechter Prognose. Für die Festsetzung der Prognose wurde eine Reihe von prognostischen Richtlinien, Skore und Modellen ausgearbeitet, wesentlich ist jedoch die klinische Beurteilung und die Schlussentscheidung des Arztes.

Eine Reihe von Studien der verschiedenen Kliniken legte zwei Ausnahmen fest, wann die KPR nicht eingeleitet wird, und wann man die aggressive Behandlung im Sinne „Do not resuscitate orders“ nicht anwendet (DNR Anordnung):

- 1) Aufgrund der Autonomie, wenn der Patient vorher mit der KPR nicht einverstanden ist, oder wenn er nicht kompetent ist, entscheidet seine Familie oder sein gesetzlicher Vertreter, dass die Behandlung nicht fortgesetzt wird;
- 2) der Arzt ist nicht verpflichtet die Diagnostische- und Behandlungsverfahren mitzuteilen (auch wenn sie von der Familie verlangt werden), wenn er sie für belanglos („futile“) halt. Der Begriff der Belanglosigkeit („futility“) kann auf verschiedener Weise verstanden werden, aber immer muss man ethische Prinzipien der Wirksamkeit, oder Unwirksamkeit der sozialen Gerechtigkeit („social justice“) und Autonomie des Patienten erwägen.

In der Medizin der Verbrennungen treten weitere qualitativ unterschiedliche Faktoren zu, die die DNR Anordnung (einschliesslich withheld + withdrawn treatment) unterstützen. Dieses Dilemma kann nur auf einer interdisziplinären Ebene entschieden werden.

**Key words:** medical ethics, ethical principles, do-not-resuscitate orders, withheld or withdrawn treatment, futile treatment, prognostic prediction, prediction rules, informed patient consent, patient self-determination act

More than 200 years ago Samuel Johnson taught medical students: „It is our first duty to serve society...“ The true service to the society has

changed over centuries, especially, during the last two decades. There emerged ethical problems of a character rather different from those encountered



20 years ago (Königová, 1976) (1). They have been arising consequently with changes in the practice of medicine due to advances in science, along with alterations in law and societal perceptions. We have come to realize that many patients are saved but remain with severe disabilities and that we possess only limited resources.

There is growing a trend among physicians to accept death of patient without a sense of failure. This trend is illustrated by the acceptance of „DO-NOT-RESUSCITATE“ orders, concept unheard over the past 2000 years. However, even Hippocrates principles allowed physicians to do what they considered best for patients and not providing care for patients who were „overmastered by their disease“ (2).

Resuscitation medicine has established its place in health care and may be defined as „...the science, technology and practice of efforts to reverse acute terminal states and clinical death.“ (3).

Resuscitation consists of emergency resuscitation and long-term resuscitation (i.e. intensive care). The steps of cardiopulmonary resuscitation (CPR) are grouped into basic, advanced and prolonged life support. Life-saving measures carried out at the scene, during transportation and in the hospital emergency department, operating room and intensive care unit represent the life-support chain, i.e. **emergency and critical care medicine continuum**.

Previously inconceivable possibilities have been developed, but at a price. This price has included not only tremendous financial costs, but also the additional cost of human suffering. The principles stating that access to the so-called „titrated therapy“ is the right of each individual, creates a whole complex of ethical decisions:

- when and whether - if at all - should therapy be started?

- when should the therapy be discontinued?

- what quality of life are we able to provide to the patient?

- what are our ethical responsibilities when patient or surrogate demand **futile treatment**?

From Greek mythology (collecting water in leaky sieves) has come the concept that futile acts, including medical interventions (4), are ineffective and incapable of achieving a desired result or goal. There are several kinds of goals: - physiologic (influencing single vital signs like blood pressure), - postponing death (ATB administration), - lengthening life (by use of mechanical ventilation), - improving quality of life (to enable independent living).

An intervention could be futile if it failed to meet one or all of these goals. A treatment that merely preserves permanent unconsciousness or cannot end dependence on critical care should also be considered futile. One word that might replace „futile“ is „responsible“, meaning rational, not excessive, and generally agreed upon.

Advocates for health care reform (Teno et al., 1994) (5) claim that significant savings could be achieved if „futile“ care were eliminated. In 1981 the World Medical Association adopted a law, making it the duty of the physician to preserve human life under all circumstances. Recently, the physicians are constantly reminded that offering care to every patient without estimating the severity of injury or illness and thus quantifying the risk of death, is an approach of the past. Various **models for prognostic prediction** provide rough evaluation of patient outcome, but there are statistical reasons why they may not work when are tested in different populations. In 1994 O'Keefe and Ebell (6) published a study comparing two clinical predictive rules in the identification of patients who were unlikely to survive following CPR. They calculated from the most recent data available: the PRE-ARREST-MORBIDITY index (PAM) and the PROGNOSIS-AFTER-RESUSCITATION score (PAR). The PAR performed better than the PAM in providing useful prognostic information to physicians and patients involved with decisions about DNR orders.

Another consideration regards the **misclassification rate** and the **specificity of the rule**. The model should not incorrectly predict death in patients whose recovery is feasible. The level of specificity is not solely based on mathematics. It also includes factors such as wishes and options of relatives and society to continue to treat such patients despite the cost, both in human and financial terms. Prediction rules suffer from criticisms that are not based upon their design. There is disagreement on how much computer predictions should influence medical decision, when the use of such rules may lead to nihilism. If treatment is withdrawn on the basis of a prediction rule, the prediction will almost certainly be fulfilled. Nevertheless, appropriately used prediction rules may represent an advanced form of audit. A computer-generated prediction of death is an objective statement concerning patient's inability to overcome the initial insult or serious illness despite therapy. Prognostic scoring systems may confirm early decision about relevance of continuing treatment and writing of a DNR order or withdrawing treatment. Using these scores specifically for limiting care was not intended by their developers. The systems only analyze hospital mortality. Furthermore, physicians who use these systems must realize that there is always some chance that an individual patient will survive despite a high likelihood of hospital mortality. In addition to the fact that outcome cannot be perfectly predicted, the concept of futility is limited in that physicians, patients, surrogates and other parties may view futility differently.

Although the issue of physician refusal of requested care has not been resolved by case law or legal statute, it is supported by compelling **ethical principles**.



Medical ethics is a set of moral principles that govern the behaviour of physicians and other health professionals. Two principles relate specifically to medical care: **BENEFICENCE** - preserving life and **MALEFICENCE** - doing no harm. The other two: **SOCIAL JUSTICE** and **AUTONOMY** guide all human relationships.

Autonomy complicates the physician-patient relationship by introducing a set of factors that continually vary with each patient. Attitudes toward life and death as well as medical problems combine uniquely in each patient. In following the ethic of autonomy, physicians are guided not only by their own feeling and beliefs, but also by those of the patient. Before a physician can know what limits of treatment a patient considers acceptable, the patient must know the risks and benefits of the intervention and all possible complications including an altered quality of life, or even death. While physicians previously thought that keeping such information from patients protected them, it is now acknowledged that patients should have it. Although the right of patient autonomy was articulated in 1914 and the phrase „informed consent“ was coined in 1957 (7), it was not until 1985 that open discussion of explicit policies to limit medical care began. Already in 1986 Brett among others (8) described three **circumstance in which requested care is not necessary**:

1. when such care is not likely to confer benefit,
2. when such care is likely to cause more harm than good,
3. when the request, although not harmful and without benefit, conflicts with distributive (social) justice.

However, the refusal of a given intervention is much more difficult to physician when life is at risk, particularly, if the intervention is already under way. In 1989 Lantos (9) recalled: „When the chance of success is low, but the alternative to treatment is death, and the patient desires therapy, the presumption should be in favour of treatment.“ One situation in which unilateral refusal of care is appropriate would involve a brain-dead patient whose family requests further mechanical ventilation. Mechanical ventilation is futile and should be withdrawn regardless of the family's wishes.

Because CPR is a measure that brings a person back to life, it is like other therapies, automatically instituted by nurses or emergency medical technicians - unless the patient's medical chart specifically contains a DNR order.

Policies concerning DNR orders have been established by hospitals and medical societies (American Society of Anesthesiologists) (10, 11). Generally, a DNR order is placed on a patient's medical record as a specific instruction signed by the attending physician that CPR should be withheld. Also included are orders designating the therapies that should not be discontinued. Pa-

tients may continue to benefit from other interventions and may even improve such, that the DNR status is no longer appropriate. Thus these orders need daily reevaluation.

The most important aspect of the DNR order may be that it formalizes the influence of the patient's autonomy in medical care, even though the DNR order arose out of the medical concern that a drastic therapy was not always effective. According to Layon and Dirk (12) DNR order although implying the patient's autonomy, is not always taken into account, because discussion between physician and patient or surrogate - when patient is competent - does not begin until approximately one week after admission, by which time a majority of patients had become incompetent.

Generally, patients who request a DNR order have an irreversible illness whose suffering will continue and increase until death insues. The focus is as often on **suffering**, which the patient must identify, as on the **imminence of death**, which a physician identifies. Eventhough patients may want to take part in the decision, they may hesitate to express openly a preference for death, because refusing treatment can be construed as „suicide“. On the other hand, physicians may not discern subtle signals from a hesitant patient simply because there is not enough time „to just talk“. **Open and frequent communication with the patient or surrogate** is necessary in order to understand clearly the rationale for the DNR order when it is not based on lack of medical benefit. A DNR order may be based on **patient's perception of quality of life** after CPR as opposed to quality of life before CPR, when the patient considers quality of life before CPR to be marginal.

Majority of studies emphasize that DNR orders should be written on a patient's chart not only after discussion with the patient or surrogate but also after **discussion among all pertinent medical and nursing staff**.

Hospital policies have to be reconsidered and changed to allow physicians to write a **DNR order over family objections** when:

- the patient lacks decision-making capacity,
- the burdens of treatment outweigh the benefits,
- the surrogate does not give an appropriate reason in terms of patient values, preferences, or best interests,
- the physician has made serious efforts to communicate with the family and to mediate the disagreement.

Furthermore, when CPR would clearly provide no medical benefit to the patient, policy should not require that it be discussed with either the patient or the family.

Although ethical principles seem well established, there are inconsistent interpretations and practices at the bedside not only in the United States (13), but in all countries where restructur-

ing of the relationship between physicians and patients - providers and consumers (clients) takes place.

Intensivists in Canada (14) rate **poor prognosis for survival** and **poor quality of life** - should the patient survive - as being the **two most important factors when making a decision to withhold or withdraw treatment**, while patient's age and physical health prior to hospital admission are the two least important factors. It is the nature of the **patient's course in the ICU**, as opposed to their status on admission, which most influences decisions to withhold or withdraw treatment. The approach in Canada is **to supply full aggressive therapy** until it is evident that the patient is not improving and further care is unlikely to restore the patient to health. At this point after consultation with the family and the team (appropriate physicians), the first step is made - writing DNR order, after which inotropes are discontinued. Mechanical ventilation is then withdrawn, in a stepwise manner. This process is called „terminal weaning“, while sedative drugs are used to prevent respiratory distress. Morphine is the drug of choice and large doses are required. It is essential to make the patient comfortable during weaning even if the use of sedatives hastens death. It should be emphasized that withdrawal of treatment does not mean the cessation of all care and that **all is done to ensure patient comfort**.

There is a clear trend for wider application of the **limited therapy**, which has a different interpretation late into the ICU course (later than 72 hours) than when applied at or shortly after admission (15). Late in the ICU course, it has to be decided by the medical team, family or surrogate decision maker that the patient has failed or is in the process of failing. Early use of DNR may be related to limitations based on pre-existing chronic or subacute disease burden or an unwillingness to proceed with a full ICU course of therapy. (13). It is unclear how Ethics Committees, risk management and hospital administrators, national practice guidelines, governmental sponsored health care reform will deal with the **highly complex individual patient-physician-family-Health Proxy interface** as practiced in the U.S. Dialogue between the American Society of Critical Care Medicine among interested physicians could provide a format for a multi-cultural context to discuss the end of life issues in the ICU setting (16). **Terminal care of the very old** was studied by Hesse in 1995 (17). There was examined the use of advance directives, limitations of treatment and medical interventions. Study periods before and after the implementation of the **PATIENT SELF-DETERMINATION ACT** of 1990 (18) were chosen to search for if there has been a change in terminal care: the results showed that there was applied less aggressive treatment, DNR orders were written earlier in the hospital stay in 95.8 % of very old

patients. The use of „comfort measures only“ increased and further investigations or interventions were not done.

About 30 % of the patients came from nursing homes though they could have been adequately cared for there with availability of simple diagnostic tests, oxygen, pain control, intravenous medication and other supportive care. Gorbein (19) suggested that severity of disease rather than age was a better predictor of expensive hospital care.

**American Hospice programs** have generally DNR policies since their inception and assume that a signed DNR order is a prerequisite to being accepted as a hospice patient.

An other problem was commented in 1991 by Walker (20): Should DNR orders be routinely withdrawn when terminally ill patients undergo **palliative surgery**? The patient's right to refuse treatment outweighs physician's moral concerns about professional scrutiny over intraoperative death. Physician's moral concerns about hastening patient death may be assuaged by:

- patient's acceptance of operative mortality risk,
- viewing matters as analogous to surgery on Jehovah's Witnesses who refuse life-saving transfusions,
- viewing patient's intraoperative death as a double effect - unintended negative effect that is linked to a good act (palliation),
- distinguishing this from assisted suicide.

Patient and staff attitudes **in the context of cancer** were studied by Owen in 1992 (21): 30 % of patients sample would not consent to CPR. Patient attitude to treatment withdrawal and refusal of CPR is related to disease progression and likely to change over time. This supports a dynamic and **evolving model of advance directives** rather than any fixed decree. The results suggest that there are other qualitative factors that contribute to DNR orders beyond the usual criteria disease-based (old patients with treatment side-effects poor quality of life, psychiatric past history, frequent depressive affect).

Different qualitative factors contributing to DNR decisions are encountered in BURN MEDICINE. (22). Modern burn care often leads to the dilemma of what should or should not be done for patients with clinical deterioration and organ system failure with no response to therapy. The questions of burn team are: „When is enough enough?“ and „Who decides?“. There is recommended a structured conference to address these issues and to help decide whether to continue invasive diagnostic and therapeutic interventions or to allow the patient die with dignity. The good death - „**DEATH WITH DIGNITY**“ has increasingly become a MYTH. It has always been for the most part a myth, but never nearly as much as today. **ARS MORIENDI** (23) was religious and spiritual endeavour, but nowadays, it is made difficult by the very fact of our attempts at conceal-



ing and preventing which result in the kinds of deathbed scenes that occur in such specialized hiding places as intensive care units, oncology research facilities, and emergency rooms.

The structured conference mentioned above can be requested by any member of the burn team who feels uncertain with what is being done for the patient (22). It is a meeting of the entire team, and its purpose is to discern the judgement of the group. When the consensus decision is to withdraw additional therapy, the decision is then presented - according to Frantianne - to the patient and then to the patient's family. The decision made by the group removes the responsibility of any individual from making a stressful decision. However, the final and principle responsibility - according to our experience - lies with the head of the burn center. The family feels a great deal of relief, because they are not forced to make the decision even though they want it made. Inviting nurses to be active participants in decision-making process should build their personal and professional self-esteem and binds the team members into a more tight community. The wisdom of the team is always best.

Every life is different from any that has gone before it, and so is every death. The uniqueness of each of us extends even to the way we die (23), unless the death follows the DNR order and the withheld or withdrawn treatment.

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## SOUHRNÝ ČLÁNKŮ

### REKONSTRUKCE S RŮZNÝMI VOLNÝMI LALOKY U PACIENTŮ S RAKOVINOU V OROFACIÁLNÍ OBLASTI

*H. M. Bhatena, D. N. Savant, N. M. Kavarana,  
D. M. Parikh, V. D. Sanghvi*

U 75 pacientů, kteří podstoupili radikální odstranění karcinomu v oblasti hlavy a krku, byla provedena rekonstrukce volným přenosem tkáně. Přímo bylo možné provést volný přenos tkáně v 69 případech. V 6 případech nebylo možné úspěšně odebrat volný lalok z následujících důvodů: 1) nevhodná žilní drenáž jako v „Anterior Rib Osteomyocutaneous Composite Flap, AROCF“ (2 případy), 2) poranění cév během odběru laloku, jako v případě paraskapulárního laloku (1 případ), 3) residua rakoviny, která nebylo možno odstranit totální excizí (2 případy) a změna operačního programu v důsledku okolností stanného práva s náhlým vyhlášením (1 případ). Těchto 6 případů nebylo zařazeno do studie. V důsledku těchto okolností a dalších různých důvodů byl použit alternativní rekonstrukční postup. Volný přenos tkáně byl úspěšný v 64 případech (92,7 %). V 5 případech nebyl zvolený operační postup úspěšný a stav byl řešen následnou operací. Z 69 případů byla u 65 pacientů provedena rekonstrukce ihned, primárně, jako jednodobý operační výkon. Byly analysovány a diskutovány funkční i kosmetické výsledky a komplikace během operačního a pooperačního období. V žádném případě nebyla použita intermaxilární fixace k udržení skusu. Všechny případy, u nichž to bylo nezbytné, byly v časném pooperačním období doléčeny protézami, které obnovily skus.

### DLOUHODOBÁ SLEDOVÁNÍ PO CHIRURGICKÉ LÉČBĚ SKAFOCEFALIE

*H. Krásničková, D. Zemková, I. Škodová*

78 pacientů bylo operováno ve Fakultní nemocnici v Praze-Motole pro skafocefalii v průměrném věku 1,2 (+/- 2,3) roku. Všechny operované děti (technikou „free bone flap“) byly v dlouhodobém sledování jednoho neurochirurga a jednoho antropologa. Nedílnou součástí diagnostiky kraniosynostózy, indikace k jejímu chirurgickému řešení, postoperačního sledování i zhodnocení efektu operace je v pojetí motolského pra-

coviště neinvazivní metoda přímé kefalometrie. Lepší kosmetický výsledek operace autoři prokazují u dětí operovaných do 1 roku oproti dětem operovaným až po 1. roce života (změna tvaru neurokrania dle cefalického indexu o 6,5 jednotek oproti 3,7 jednotkám,  $p = 0,02$ ).

### FIXACE JAZYKA ZÁVĚSEM POD MANDIBULU U PIERRE ROBINOVA SYNDROMU

*J. Ramba*

U některých dětí s diagnózou Robinova syndromu nelze vystačit s konzervativním léčebným postupem pro opakující se glosoptózu a akutní obturaci horních dýchacích cest, což vede k asfyktickým záchvatům. Ohrožení dětí touto komplikací je natolik závažné, že vyžaduje urgentní chirurgické řešení. Jeho cílem je umělá ankyloglosie. Mnohdy však bývá neúspěšná prořezáním založených stehů. V práci je uvedena technika provedení závěsové fixace jazyka, která se nám velmi osvědčila.

### POHLAVNÍ ROZDÍLY VE VÝSKYTU OROFACIÁLNÍCH ROZŠTĚPŮ A OTÁZKA PRIMÁRNÍ PREVENCE V RODINÁCH S GENETICKÝM RIZIKEM

*M. Peterka, R. Peterková, M. Halašková, M. Turdek,  
M. Fára, Z. Likovský*

Systematická registrace všech žijících dětí s orofaciálním rozštěpem narozených v Čechách začala na Klinice plastické chirurgie v Praze v roce 1964. Pro tuto studii byl vybrán vzorek 181 dětí s pozitivní rodinnou zátěží, kde orofaciální rozštěp měl vždy jeden z rodičů. Cílem této studie bylo sledovat nejenom závislost typu rozštěpu u dětí a rodičů, ale také vztah mezi pohlavím dětí a rodičů. U matek s rozštěpem rtu (CL) se narodilo 68 % chlapců a pouze 32 % dívek s CL nebo s CLP (rozštěp rtu a patra). Jestliže měla matka CLP, stejný typ rozštěpu byl nalezen u 64 % chlapců a pouze 15 % dívek. Jestliže matka měla CP (rozštěp patra), stejný typ rozštěpu měli chlapci v 37 % a dívky v 51 %. Podobné výsledky jsme obdrželi v rodinách, kde byl rozštěpem postižen otec. Pouze jedna výjimka

byla pozorována u otců s CLP, kde se narodilo přibližně stejné množství chlapců (43 %) i dívek (40 %) s CLP. Závěrem lze říci, že přítomnost vady u dítěte závisí nejen na typu rozštěpu u rodičů, ale také na pohlaví dítěte. V rodinách s genetickou zátěží, kde matka má CL nebo CLP nebo otec má CL, by bylo možné snížit riziko vzniku vady pomocí prekoncepční nebo prenatální volby pohlaví dítěte. Navíc je dnes možné použít transvaginální ultrazvukové vyšetření plodu, s jehož pomocí lze rozštěp rtu zjistit již mezi 12. - 16. týdnem těhotenství.

### **DLOUHODOBÉ SLEDOVÁNÍ PO REKONSTRUKČNÍCH OPERACÍCH FLEXORŮ RUKY**

*V. Smrčka, J. Samohýl, P. Holuša*

Autoři popisují způsob sledování a hodnocení výsledků léčby u pacientů, kteří podstoupili rekonstrukční výkon na šlachách flexorů ruky. Ve formuláři, který slouží k záznamu, je popsán stav před operací, peroperační nález, druh operačního výkonu, stav po operaci, průběh rehabilitace a dále stav po 6 měsících až 10 letech po operaci.

### **ROZSAHY KLOUBNÍCH POHYBŮ DOSPĚLÉ RUKY**

*B. Škvařilová, A. Plevková*

Jsou předloženy normy kloubních pohybů dospělé zdravé ruky. Vyšetřeno bylo 100 mužů a 100 žen ve věku 20 - 25 let. Jednalo se o vysokoškolské studenty, kde ruka není ovlivněna prací ani jiným jednostranným zatížením a její pohyblivost můžeme považovat za optimální (leváci nebyli do souboru zahrnuti). Měřeny byly na všech prstech obou rukou a na zápěstí aktivní i pasivní flexe a hyperextenze, na zápěstí též obě aktivní dukce. Výsledky mohou sloužit pro posuzování odchylek v kloubní pohyblivosti ruky u vrozených vad a jiných onemocnění, u poúra-

zových stavů, při rehabilitaci, při hodnocení vlivu pracovní a jiné zátěže na ruku apod. Posouzeny byly také rozdíly v hybnosti jednotlivých kloubů téhož typu a rozdíly mezi pravou a levou stranou a pohlavími.

### **PŘÍKAZ „NERESUSCITOVAT“ A NEPOSKYTNUTÍ ČI USTOUPENÍ OD LÉČBY**

*R. Königová*

Vývoj v medicíně přinesl nesmírné možnosti léčebné, ale též nesmírné finanční náklady a také prodloužení lidského utrpení. Kardiopulmonální resuscitace (CPR) je neodkladný rutinní výkon u pacientů s kardiopulmonální zástavou. Výsledek CPR závisí na charakteru a závažnosti choroby a stavu pacienta před zástavou i na jeho odpovědi na léčbu. Zahájení CPR je povinností všech zdravotníků i u pacientů v terminálním stavu a s celkově špatnou prognózou. Ke stanovení prognózy byla vypracována řada předpovědních pravidel, skóre a modelů, ale podstatné je klinické posouzení a rozhodnutí.

Řada studií nejrozličnějších pracovišť stanovila dvě výjimky, kdy CPR není zahájena a kdy se od agresivní léčby ustupuje ve smyslu „Do not resuscitate orders“ (DNR příkaz):

1. na základě autonomie pacient předem vyjádří nesouhlas s CPR nebo je-li nekompetentní, rozhodne jeho rodina či zákonný zástupce, aby se v léčbě nepokračovalo;

2. lékař není povinen poskytovat diagnostické a léčebné výkony (ani jsou-li vyžadovány rodinou), pokud je považuje za marné („futile“). Pojem marnosti („futility“) může být chápán různě, ale vždy je třeba zvážit etické principy beneficence, maleficence, společenské spravedlnosti („social justice“) a autonomie pacienta.

V popáleninové medicíně pak přistupují další kvalitativně odlišné faktory, které podporují DNR příkaz (včetně withheld + withdrawn treatment). Toto dilema lze řešit jen na základě rozhodnutí interdisciplinárního týmu.

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