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Dear Colleagues, Dear Friends,

a year elapsed since the wall dividing western Europe from central and eastern Europe collapsed at last. It collapsed because it was cemented by falsehood and injustice. The impetus that brought the wall down were not the trumpets of Jericho but the loud clear voice of the suppressed people.

Human rights can be respected fully now in our country and in the lands of our neighbours. There exist no longer any obstacles hindering friendship and cooperation between scientists and surgeons from different parts of the world.

Our journal represented in the past one of the thin, tender ties connecting East and West, yet it had to respect some limitations. This tie, now in our new situation, in our freedom, can develop into a strong durable bond, without restrictions and discrimination.

We hope most sincerely that you will help us strengthen this tie by your cooperation, your papers and interest. Thus we shall all contribute in a small way to a harmonious Europe, a peaceful world, free exchange of knowledge, and brighter prospects for all.

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CLINICAL SIGNIFICANCE OF AGE-RELATED CHANGES OF THE PALPEBRAL FISSURES BETWEEN AGE 2 AND 18 YEARS IN HEALTHY CAUCASIANS

T. HRECZKO*, L. G. FARKAS**, M. KATIC***

DEFINITION OF TERMS

Abnormally larger (supernormal) measurement or index: values
larger than the normal mean + 2SD (Farkas et al., 1977).

Abnormally small (subnormal) measurement or index: values
smaller than the mean - 2 SD (Farkas et al., 1977).

Absolute total growth: difference (in millimetres or degrees) between
the measurements at 2 and 18 years of age (Farkas, 1987)

Age of full maturation:

In measurements or indices increasing with age: age at which the mean
value of the finding plus two standard errors of the mean (SEM) reached
the mean minus two standard errors of the mean (SEM) at 18 years of age.
In measurements or indices decreasing with age: age at which the mean
value of the finding minus two standard errors of the mean (SEM) reached
the mean plus two standard errors of the mean (SEM) at 18 years of age.

$$SEM = \frac{\text{Standard Deviation}}{\sqrt{N}} \quad (\text{Blalock, 1960})$$

Developmental level at 2 years of age: a measurement expressed
as a percentage of the same measurement at 18 years (Farkas, Ngim, Lee,
1988).

Disharmony: the slightest disturbance of the proportionality visually
observed with an index value at the normal mean $\pm 2SD$ (Farkas, 1987).

Disproportion: abnormal relationship between measurements expressed
by an index smaller or larger than the normal mean $\pm 2SD$ (Farkas, 1987).

Intercanthal index:

$$\frac{\text{Intercanthal width (en-en)} \times 100}{\text{Biocular width (ex-ex)}}$$

Orbital width index:

$$\frac{\text{Palpebral fissure length (ex-en, 1)} \times 100}{\text{Intercanthal width (en-en)}}$$

Palpebral fissure (eye fissure) index:

$$\frac{\text{Palpebral fissure height (ps-pi, 1)} \times 100}{\text{Palpebral fissure length (ex-en, 1)}}$$

Relative annual increment: the absolute increment in the given age expressed as a percentage of the previous age (Savara and Singh, 1968). Growth is very slow if the relative increase is below average (less than 2 %), and moderate if the increase is 2 % to 3.9 %. Both relative increment qualities represent slow growth. An above-average increase of 4.0 % to 5.9 % and a rapid increase of 6.0 % or greater are regarded as fast growth (Farkas, 1981).

INTRODUCTION

Soft-tissue disfigurements of the orbital region are often caused by defects in length, height and/or inclination of the palpebral fissures and disproportion or disharmony between palpebral fissure length and intercanthal width. The most frequently reported palpebral fissure defects associated with facial syndromes are congenital ptosis of the upper eyelid, abnormally short or large fissures, palpebral fissures with abnormally small length and height (blepharophimosis) and abnormal (mongoloid or antimongoloid) eye fissure inclinations (Øster, 1952; Jöhr, 1953; Burian et al., 1960; Laestadius et al., 1968; Farkas and Lindsay, 1972; Figalová et al., 1974; Hajnis, 1974; Feingold and Bossert, 1974; Farkas and Cheung, 1979; Niebuhr, 1979; Duncan et al., 1981; Farkas, 1981; Šmahel, 1982; Farkas et al., 1985; Jensen, 1985; Šmahel and Müllerová, 1986; Farkas and Munro, 1987).

The present study was conducted to determine the developmental level of the soft orbits at age 2, to report the age of full maturation for the investigated orbital measurements and indices and to identify the age periods showing the slowest and fastest growth rates.

MATERIALS AND METHOD

The study group consisted of 1552 healthy Caucasians from 2 to 18 years of age. There were 49 to 52 subjects in each age interval from age 6 up (Farkas, 1981) and 60 subjects (30 males, 30 females) in each age interval from age 5 down (unpublished data).

Five soft orbital measurements (palpebral fissure length, height, inclination, intercanthal width and biocular width) were taken directly from the subjects (2- to 3-year olds by Hreczko, 4- to 18-year olds by Farkas). The

relationship between the measurements were studied using three proportion indices (palpebral fissure index, orbital width index and intercanthal index). Means and standard deviations for each measurement and index were calculated for both sexes and at each age between 2 and 18 years (Farkas, 1981; Farkas and Munro, 1987), and 2 and 5 years (unpublished findings).

The findings were analyzed using the standard error of differences (SED) and SAS/STAT software to generate basic descriptive statistics.

RESULTS

Developmental Level of Soft Orbital Measurements

At age 2, the most developed measurements were the palpebral fissure height in boys (93.3 %) and the biocular width in girls (86.9 %) in relation to the 18-year values. The least developed was the intercanthal width in both sexes (boys, 77.6 %; girls, 82.9 %). With the exception of palpebral fissure height, the level of development was consistently greater in girls but the difference was not significant.

Table 1. Developmental Level of Soft Orbital Measurements at Age 2

| Measurement | Sex | Age (year) | mm/degree | Percentage | Absolute total increment (mm) |
|-------------------------------|-----|------------|-----------|----------------|-------------------------------|
| Palpebral fissure | M | 2 | 26,0 | 83,3 | 5,2 |
| length. left (ex-en) | M | 18 | 31,2 | | |
| | F | 2 | 25,9 | | |
| | F | 18 | 30,7 | 84,4 | 4,8 |
| Palpebral fissure | M | 2 | 9,7 | 93,3 | 0,7 |
| height. left (ps-pi) | M | 18 | 10,4 | | |
| | F | 2 | 9,3 | | |
| | F | 18 | 11,1 | 83,8 | 1,8 |
| Intercanthal width | M | 2 | 26,3 | 77,6 | 7,6 |
| (en-en) | M | 18 | 33,9 | | |
| | F | 2 | 26,2 | 82,9 | 5,4 |
| | F | 18 | 31,6 | | |
| Biocular width | M | 2 | 76,2 | 85,2 | 13,2 |
| (ex-ex) | M | 18 | 89,4 | | |
| | F | 2 | 75,4 | | |
| | F | 18 | 86,8 | 86,9 | 11,4 |
| Palpebral fissure inclination | M | 2 | 3,8 | 181, % of the | 1,7° decrease |
| | M | 18 | 2,1 | 18-year value | |
| | F | 2 | 4,3 | 104,9 % of the | 0,2° decrease |
| | F | 18 | 4,1 | 18-year value | |

In proportion to the best developed height, the absolute total increment of the palpebral fissure was smallest between ages 2 and 18: 1.8 mm in girls and 0.7 mm in boys. Accordingly, the highest absolute total increments were observed in the least developed biocular width: 13.2 mm in boys and 11.4 mm in girls. Between 2 and 18 years, the mean absolute total loss in palpebral fissure inclination was 1.7° in boys and 0.2° in girls (Table 1).

Age of Full Maturation

The orbital measurements reached full maturation 1 to 3 years earlier in girls than in boys, with the exception of palpebral fissure height which reached full adult size 3 years earlier in boys than in girls. Full maturation was achieved first in intercanthal width, occurring between ages 8 and 11 in both sexes. The palpebral fissure and biocular width matured simultaneously at age 13 in girls and age 15 in boys. The decreasing values of the palpebral fissure inclination observed after age 2 reached their final inclination level in girls at age 15 and in boys at age 16 (Table 2).

Proportion indices. Full maturation of the three orbital indices was observed 1 to 5 years earlier in girls than in boys. The greatest difference found was in palpebral fissure index maturation which occurred at age 10

Table 2. Age of Full Maturation of Soft Orbital Measurements and Proportion Indices

| Measurement | Sex | Finding at 18-year value | | Age (year) | Full maturation value | |
|---|-----|--------------------------|---------------|------------|-----------------------|---------------|
| | | mm/ /degree | Calculated by | | mm/ /degree | Calculated by |
| Palpebral Fissure width | M | 30,8 | Mean - 2 SEM | 15 | 31,4 | Mean + 2 SEM |
| | F | 30,1 | Mean - 2 SEM | 13 | 30,2 | Mean + 2 SEM |
| Palpebral Fissure height | M | 10,0 | Mean - 2 SEM | 11 | 10,0 | Mean + 2 SEM |
| | F | 10,7 | Mean - 2 SEM | 14 | 10,7 | Mean + 2 SEM |
| Intercanthal Width (en-en) | M | 32,9 | Mean - 2 SEM | 11 | 33,2 | Mean + 2 SEM |
| | F | 31,0 | Mean - 2 SEM | 8 | 31,1 | Mean + 2 SEM |
| Biocular width (ex-ex) | M | 88,0 | Mean - 2 SEM | 15 | 90,4 | Mean + 2 SEM |
| | F | 85,6 | Mean - 2 SEM | 13 | 86,4 | Mean + 2 SEM |
| Palpebral fissure inclination | M | 2,4 | Mean + 2 SEM | 16 | 2,4 | Mean - 2 SEM |
| | F | 3,5 | Mean + 2 SEM | 15 | 3,5 | Mean - 2 SEM |
| Palpebral fissure index (ps-pi left/ex-en left) | M | 32,4 | Mean + 2 SEM | 15 | 33,2 | Mean - 2 SEM |
| | F | 35,4 | Mean + 2 SEM | 10 | 35,4 | Mean - 2 SEM |
| Orbital width (ex-en left/en-en) | M | 93,2 | Mean - 2 SEM | 13 | 93,9 | Mean + 2 SEM |
| | F | 95,1 | Mean - 2 SEM | 12 | 95,2 | Mean + 2 SEM |
| Intercanthal index (en-en/ex-ex) | M | 37,4 | Mean + 2 SEM | 14 | 37,4 | Mean - 2 SEM |
| | F | 37,0 | Mean + 2 SEM | 12 | 37,1 | Mean - 2 SEM |

in girls and age 15 in boys. Full maturation of the orbital width index was noted in 12-year-old girls and 13-year-old boys. The intercanthal index reached the adult level at age 12 in girls and age 14 in boys (Table 2).

Relative Annual Growth Increments Between Ages 2 and 18

Intercanthal width grew quickly in both sexes (7.8 % to 11 %) between ages 3 and 4. In boys, a slower above-average growth (4.5 %) was observed between ages 10 and 11. Before maturation (age 11 in boys and age 8 in girls), there was a period of slow growth from age 4 to 7 in boys and from age 4 to 8 in girls. In boys, a second growth spurt with above-average increments (4.5 % and 1.4 mm) was observed just before the maturation time, between 10 and 11 years. After maturation, the growth slowed markedly in both sexes (Table 3).

Biocular width. Until maturation (in boys at 15 years and girls at 13 years), biocular width generally grew at a moderate rate (2.0 % to 2.9 %) in both sexes. However, there were very slow-growing periods (less than 2 %) from ages 3 to 10 and 11 to 14 years in boys and from ages 3 to 6 and 10 to 12 in girls. After maturation, the absolute average increments were minimal (Table 3).

Palpebral fissure length (left, 1). Before maturation (age 15 in boys, age 13 in girls), palpebral fissure growth was moderate (2.2 % to 3.8 %) in

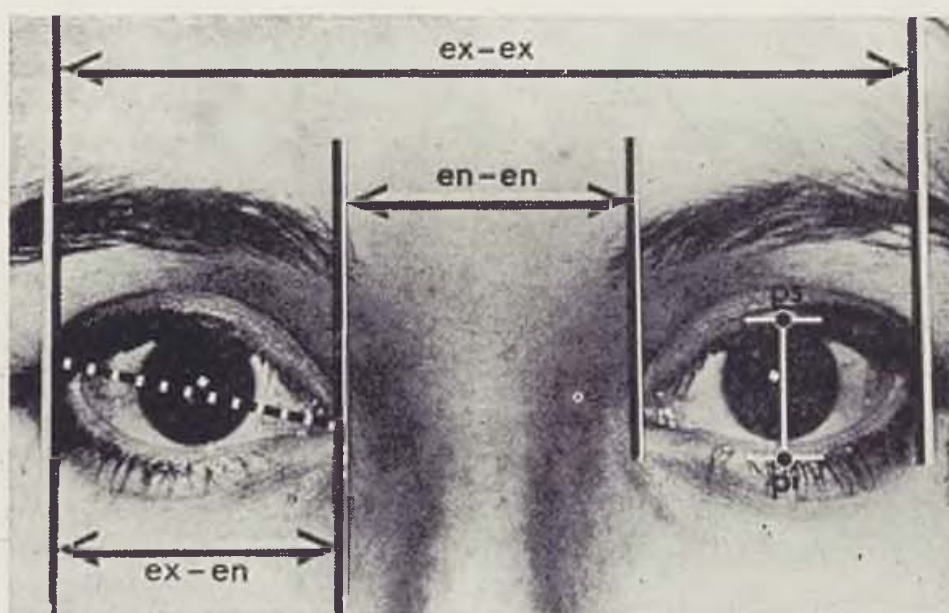


Fig. 1. Interanthal width (projective distance between the endocanthions, en-en); biocular width (projective distance between exocanthions, ex-ex); palpebral fissure length (projective distance between exocanthion and endocanthion, ex-en); palpebral fissure height (the greatest vertical distance between the free edges of each eyelid, ps-pi); inclination of the palpebral fissure is determined by measuring the angle between its axis (dotted line connecting the endocanthion and exocanthion points) and the horizontal.

Table 3. Annual Relative Increments in Orbital Measurements

| Age in years | Intercanthal width (en-en) | | | | Biocular width (ex-ex) | | | | Palpebral fissure length (ex-en, left) | | | | Palpebral fissure height left (ps-pi, left) | | | | Palpebral fissure inclination | | | |
|--------------|----------------------------|-----|------------|------------|------------------------|-----|---------|-----|--|-----|---------|-----|---|-----|------------|-----|-------------------------------|------|---------|------|
| | males | | females | | males | | females | | males | | females | | males | | females | | males | | females | |
| | | | | | | | | | | | | | | | | | | | | |
| | % | mm | % | mm | % | mm | % | mm | % | mm | % | mm | % | mm | % | mm | % | mm | % | mm |
| 2 to 3 | 3.8 | 1.0 | 2.7 | 0.7 | 2.0 | 1.8 | 2.4 | 1.8 | 3.8 | 1.0 | 1.9 | | 1.0 | | 3.2 | 0.3 | -7.9 | -0.3 | -4.7 | -0.2 |
| 3 to 4 | <u>11.0</u> | 3.0 | <u>7.8</u> | <u>2.1</u> | 1.9 | | 1.6 | | 2.2 | 0.6 | 2.7 | 0.7 | 1.0 | | <u>4.2</u> | 0.4 | | | -4.4 | -0.3 |
| 4 to 5 | 1.7 | | 1.4 | | 1.7 | | 1.7 | | 0.4 | | 0.7 | | | | | | -50.0 | -2.9 | -38.5 | -2.5 |
| 5 to 6 | | | 1.4 | | | | 2.1 | 1.6 | | | 1.5 | | | | | | | | | |
| 6 to 7 | | | 1.0 | | | | | | 1.8 | | | | | | | | | | | |
| 7 to 8 | 3.3 | 1.0 | 1.3 | 0.6 | 1.6 | | 2.8 | 2.2 | 1.8 | | 2.9 | 0.8 | 2.2 | 0.2 | 4.3 | 0.4 | -8.3 | -0.3 | -25.5 | -1.2 |
| 8 to 9 | 1.6 | | 2.0 | | 1.7 | | 0.5 | | 1.8 | | 0.7 | | 1.1 | | 1.0 | | | | | |
| 9 to 10 | | | 0.3 | | | | 1.2 | | 1.8 | | 0.7 | | 1.1 | | | | | | | |
| 10 to 11 | 4.5 | 1.4 | 1.3 | | 2.9 | 2.4 | 1.0 | | 0.7 | | 1.7 | | 1.4 | | 3.0 | 0.3 | -18.2 | -0.6 | -7.7 | -0.3 |
| 11 to 12 | | | | | 0.5 | | 2.2 | 1.8 | 1.7 | | 2.1 | 0.6 | 2.1 | 0.2 | | | -7.4 | -0.2 | -5.6 | -0.2 |
| 12 to 13 | 2.5 | 0.8 | 1.9 | | 1.4 | | 2.2 | | 1.4 | | 2.1 | | 1.0 | | 4.0 | 0.4 | -6.9 | -0.2 | -5.9 | -0.2 |
| 13 to 14 | 0.9 | | 0.6 | | 0.1 | | | | 0.3 | | | | | | | | | | | |
| 14 to 15 | 1.8 | | 0.9 | | 2.9 | 2.5 | 2.0 | 1.7 | 3.7 | 1.1 | 2.4 | 0.7 | 3.1 | 0.3 | 1.9 | | -6.7 | -0.2 | -22.0 | -0.9 |
| 15 to 16 | | | | | 0.3 | | 0.8 | | 0.6 | | 0.3 | | 2.0 | 0.2 | 1.9 | | -17.9 | -0.5 | | |
| 16 to 17 | 1.5 | | 2.2 | 0.7 | 1.1 | | | | 0.3 | | 1.0 | | 1.0 | | 3.7 | 0.4 | -8.7 | -0.2 | -8.0 | -0.9 |
| 17 to 18 | | | | | | | | | | | | | | | | | | | | |

Notes: Values < 2 % represent very slow growth; therefore, no absolute increment values were given.

Values of 2.0 % to 3.9 % indicate moderate growth.

Values of 4.0 % to 5.9 % show above-average growth (values underlined).

Values of 6.0 % and over indicate rapid growth (values in square).

boys from ages 2 to 3, 4 to 5 and 14 to 15 and very slow from age 5 to 14. In girls, a moderate growth (2.1 % to 2.9 %) was noted from ages 4 to 5, 8 to 9 and 12 to 13, with very slow-growing periods from ages 2 to 4, 5 to 8 and 9 to 12. After maturation, the average absolute changes were negligible (Table 3).

Palpebral fissure height (1). In boys, the growth was very slow (1.0 % to 1.1 %) between ages 2 and 7 and 8 and 11 (maturation: 11 years), and moderate (2.2 %) between ages 7 and 8. In girls, slightly faster (above average: 4.0 % to 4.3 %) growth was reported from ages 3 to 4, 8 to 9 and 13 to 14 (maturation: 14 years), whereas very slow growth was seen from ages 4 to 8, 9 to 11 and 12 to 13. After maturation, the changes were minimal (Table 3).

Palpebral fissure inclination (1). Before maturation (age 16 in boys, age 15 in girls), the greatest absolute decrease in inclination of the palpebral fissure (2.9° in boys, 2.5° in girls), was found between ages 5 and 6. In addition, in girls there was an average decrease of 1.2° from age 7 to 8. Very small changes were seen at other ages and after maturation (Table 3).

Age-Related Changes in Orbital Proportion Indices

Intercanthal index. The index value in both sexes increased with age from 34.6 to 36.8 in boys and from 34.8 to 36.4 in girls. However, the index value reached its highest level at 5 years (39.2 in boys, 38.5 in girls) because of the marked increase in intercanthal width compared to biocular width (Table 3). After age 5, a continuous moderate decline was observed in the index values.

Orbital width index. Two trends were seen in orbital width index. Between ages 2 and 4, the values of the index greatly decreased (from 99.2 to 88.5 in boys and from 98.9 to 90.3 in girls). After age 5, they showed a slow but continuous growth up to 95.4 in boys and 97.5 in girls. The early decrease in index values was caused by relatively larger increments in the intercanthal width than in the length of the palpebral fissure.

Palpebral fissure index. Age-related changes in palpebral fissure index differed between males and females. The index decreased moderately with age in boys (from 37.2 to 33.4) and increased slightly in girls (from 35.9 to 36.2). The difference can be explained by a slightly faster growth in the length than in the height of the palpebral fissure in boys. However, because of the changing rate of growth in the two components of the palpebral fissure, the age-related changes in the index values were not gradual in either sex. In boys, the index values reached the lowest level (33.0) at age 11 and then increased very slightly. In girls, a smaller decrease in index values was observed up to age 13 (33.9), followed by a moderate increase.

DISCUSSION AND CONCLUSIONS

This study has shown great differences in developmental levels, absolute total increments, and time and degree of relative annual increments of measurements between age 2 and maturation. The least developed intercanthal width (77.6 % to 82.9 %) revealed the only fast growth in both sexes (11.0 %

in boys and 7.8 % in girls between ages 3 and 4). The largest absolute increments between 2 and 18 years (13.2 mm and 11.4 mm) were identified in biocular width. The marked drop in palpebral fissure inclination between ages 5 and 6 (2.9° in boys, 2.5° in girls) and the mild decreasing trend at later stages were surprising. The rate of growth in the palpebral fissure length was greatly influenced by the growth of the biocular width, with the same maturation time of the two measurements in both sexes (13 years in girls, 15 years in boys). Between 2 and 18 years, the smallest absolute total increments (0.7 mm in boys and 1.8 mm in girls) were found in the height of the palpebral fissure, with the highest relative developmental level occurring in boys (93.3 %). There were moderate annual relative increments in biocular width and palpebral fissure length in both sexes, and in palpebral fissure height in boys (2.0 % to 3.9 %). Generally, the age periods exhibiting the slowest growth (less than 2 %) were between 5 and 7 and 9 and 10.

The maturation of the orbital indices occurred between ages 10 and 15 in girls, which was earlier than in boys. The values of the intercanthal index between ages 2 and 18 showed a moderately increasing trend in both sexes (34.6 to 36.8 in boys, 34.8 to 36.4 in girls). The index values of the orbital width in the same time period decreased (99.2 to 95.4 in boys, 98.9 to 97.5 in girls), indicating a relative enlargement of the intercanthal width in relation to the palpebral fissure length. Between ages 2 and 18, the palpebral fissure index decreased markedly in boys (from 37.2 to 33.4) and increased slightly in girls (from 35.9 to 36.2). These findings show that at age 2, the palpebral fissure in boys is relatively high in relation to its length (more than one-third of the length) but at age 18 the height of the palpebral fissure is relatively smaller (one third of the length). In girls, the initial optimal relationship between the two measurements of the palpebral fissure improves with age, resulting in relatively high palpebral fissures, which are more attractive than those in boys.

A knowledge of the developmental levels of individual orbital measurements at early ages is helpful in estimating growth and concomitant changes that occur up to full maturation. The surgeon cannot expect noticeable changes in measurements which have already reached marked values in infancy. Consequently, data regarding full maturation levels of various measurements and indices provide a signal, or a cut-off point, beyond which no significant changes or growth can be expected. Such information is important in calculating the likelihood of postoperative growth. Full maturation is an ideal time for final surgical corrections since changes after this period are minor. Earlier corrective surgery should be planned for periods when there is slow or no growth.

A proportion index indicates the quality of relationship between measurements. This relationship is subject to change resulting from different growth rates within the orbital region. Index values which reveal age-dependent changes demand the use of age- and sex-specific controls (Farkas et al., 1989). The higher eye fissure inclination found at age 5 as opposed to age 6

and later suggests that the criteria of mongoloid inclinations should be determined carefully with the help of age- and sex-specific controls (Patterson et al., 1987). The orbital width index indicates whether the palpebral fissure length is truly disproportionately small. The palpebral fissure index is helpful in determining the degree of disfigurement in a patient with congenital or traumatic ptosis of the upper lid. In cases of bilateral ptosis, the index is useful in calculating the extent of upper lid elevation necessary to restore proportionality between the height and width of the palpebral fissure.

The cross-sectional character of the material provides clinically useful guidelines regarding quantitative data as well as information about the relationships and maturation times of soft orbit measurements.

SUMMARY

The development of surface measurements of the palpebral fissures and age-related changes in the quality of the relationships between the individual measurements were followed in 1552 healthy Caucasians between ages 2 and 18. At age 2, the height of the palpebral fissure and the biocular width (ex-ex) were the most developed features (93.3 % and 86 %) and the least developed was the intercanthal width (77.6 % to 82.9 %). The measurements reached adult size between ages 8 (intercanthal width in girls) and 16 (palpebral fissure inclination in boys). The rate of growth in the orbital measurements was usually moderate, seldom above-average and fast only in intercanthal width between ages 3 and 4. The study determined the periods with minimal growth (approximately ages 5 to 7 and 9 to 10) for each of the measurements. After maturation, the changes in measurements were minimal. A knowledge of the developmental levels of the measurements at an early age, their changes with age and their maturation times are of great importance in timing early or final corrective surgical procedures.

RÉSUMÉ

Importance clinique des changements de fentes palpébrales chez une population caucasienne saine âgées de 2 à 18 ans

Hreczko, T., Farkas, L. G., Katic, M.

Sur l'échantillon de 1552 sujets sains de la race caucasienne, âgés de 2 à 18 ans, on a étudié l'évolution des données du mesurage superficiel des fentes palpébrales et les changements du rapport entre les résultats des mesurages particuliers sous la dépendance de l'âge. A l'âge de 2 ans, la hauteur de la fente palpébrale et la distance interoculaire (ex-ex) représentaient les signes caractéristiques les plus développés (93,3 % et 86 %), la largeur intercathale était la moins développée (77,6 et 82,9 %). Les résultats de mesurage atteignaient l'état adulte entre 8 ans (largeur intercanthale chez les filles) et 16 ans (inclinaison de la fente palpébrale chez les garçons). L'accroissement d'orbite était habituellement modéré, rarement supérieur à la moyenne, et perpétuel uniquement en relation à la largeur intercanthale, entre 3e et 4e année. Les examens ont mis en évidence la période de croissance minimale (5 à 7 ans et 9 à 10 ans), et cela à chaque

mesurage. Après la puberté, les changements des résultats de mesurage étaient minimes. Les connaissances de l'évolution de niveau des résultats de mesurage à l'âge précoce, des changements liés à l'âge et à la puberté sont très importantes pour la synchronisation des interventions chirurgicales correctrices.

ZUSAMMENFASSUNG

Die klinische Bedeutung einer Veränderung der Spalte zwischen den Lidern im Alter von 2 bis 18 Jahren bei der gesunden Bevölkerung der kaukasischen Rasse

Hreczko, T., Farkas, L. G., Katic, M.

An einem Muster von 1552 gesunden Individuen der kaukasischen Rasse im Alter von 2 bis 18 Jahren wurde die Entwicklung der Angaben über eine Oberflächenmessung der Augenspalten und der Veränderungen des Verhältnisses zwischen den Ergebnissen der einzelnen Messungen in Abhängigkeit vom Alter verfolgt. Im Alter von zwei Jahren zeigten sich die Höhe der palpebralen Spalte und die Distanz zwischen den Augen (ex — ex) als die am meisten entwickelten charakteristischen Züge (93,3 % und 86 %), während die interkantale Breite am wenigstens entwickelt war (77,6 bis 82,9 %). Den erwachsenen Zustand erreichten die Ergebnisse der Messungen zwischen dem achten Jahr (interkantale Breite bei Mädchen) und den sechzehnten Jahr (Neigung der Augenspalte bei Knaben). Die Zunahme der Augenhöhle (Orbita) pflegt gewöhnlich leicht zu sein, selten überdurchschnittlich, und dauernd nur im Verhältnis zur interkantalen Breite zwischen dem dritten und vierten Lebensjahr. Die Forschung stellte eine Periode des Mindestanwachsens fest (5 bis 7 Jahre und 9 bis 10 Jahre) und dies bei jedweden Messen. Nach dem Heranreifen waren die Veränderungen der Messungen minimal. Die Kenntnis des sich entwickelnden Niveaus der Ergebnisse der Messungen im frühen Kindesalter, der Altersveränderungen und der Periode des Heranreifens ist von grosser Bedeutung für die Festlegung der richtigen Zeit zu regelnden chirurgischen Eingriffen.

SUMARIO

El significado clínico de los cambios en las rendijas de ojos en la edad entre 2—18 años en la población normal de la raza caucásica

Hreczko, T., Farkas, L. G., Katic, M.

El grupo de 1552 personas sanas de la raza caucásica en la edad de 2—18 años sirvió a los autores para estudiar los datos referentes a las mediciones superficiales de las rendijas de ojos y los cambios en las proporciones entre los resultados de las mediciones individuales en dependencia de la edad. En la edad de 2 años la altura de la rendija de ojos y la distancia entre los ojos (ex-ex) tuvieron los rasgos significativos más desarrollados (93,3 % y 86 %); el desarrollo mínimo fué observado en la anchura intercantal (77,6 % y 82,9 %). El estado maduro correspondió a los resultados de la medición realizados entre la edad de 8 años (la anchura intercantal en las muchachas) y la edad de 16 años (la inclinación de la rendija de ojos en los muchachos). El incremento de la órbita fué usualmente insignificativo, raramente superior al medio y fue permanente solamente en relación con la anchura intercantal en la edad de 3—4 años. El estudio determinó el período del mínimo crecimiento (5—7 años y 9—10 años) observado durante cada medición. El conocimiento del progreso y desarrollo de los resultados basados en la medición y realizados en la edad tierna, de los cambios registrados durante

el crecimiento y del período de la pubescencia — todo esto tiene un gran significado para preparar un buen plano de las intervenciones quirúrgicas reparadoras.

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The rest of the literature available
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ABDOMINAL WALL HERNIAS, an atlas of anatomy and repair, John L Madden, M. D.: ISBN 0-72L6-1288-1, Published by W. B. Saunders Company, Harcourt Brace Jovanovich, Inc., 1989

The book consists of 344 pages of text with a multitude of illustrations and per-operative photographs supplemented with section photographs and facsimiles of historical documents.

Continued on page 217

Pediatric Clinical Hospital No. 9, Moscow, USSR

MANAGEMENT OF EXTENSIVE BURNS IN CHILDREN

S. P. ASTROZHNKOVA, A. A. BULETOVA, L. A. VASILJEVA

INTRODUCTION

Burn injury is still considered to be one of the most complicated problems in pediatric surgery. Management of children with deep circular burns or with burns located on the posterior surface of the body and extremities, presents special difficulties. In this case a poor condition of the child does not permit to place him on his stomach. The forced position of the child, when injured surface contacts a hard bed, makes him suffer immensely, leads to liquefactive necrosis, delayed crust rejection, enhancement of microbial dissemination and intoxication, and makes nursing much more difficult. All these factors result in the prolonged wound preparation for surgery.

To a large extent, these problems may be solved by using the beds on air-fluidised pillows of the Clinitron type in the clinical management of burns as these beds permit to keep the patient in a suspended state.

There were reports about the air-pillow beds in clinical practice for adults (4, 5), but the authors have not seen such reports concerning children.

MATERIAL AND METHODS

During 3 years (1986—1988) 2723 children were treated in the Burn Department, 1465 children being under 3 years of age.

Our Department has been using the Clinitron beds since 1985. We use the beds both for adults and children. One bed is situated in the Intensive Care Unit, so that we could place children onto the Clinitron bed while they are still in the shock condition.

During this period, 79 children (age 9—14 years; burn area 10—90 % of the body surface) were treated using the Clinitron beds.

During treatment, children received conventional therapy including detoxication, antibacterial (considering the sensitivity of microflora), desensitising and hormonal therapy.

54 patients were placed onto the Clinitron bed as soon as they were delivered into the Intensive Care Unit and then, after antishock steps were taken, the patients were removed to the Burn Department and kept on the similar beds. 11 children spent more than 3—4 months on Clinitron beds. Some children were kept on the air-pillow only for several days during the

"crust drying" period or after autodermoplasty. The limited period was due to the shortage of the beds in the Department. Occasionally we had to put the children on the Clinitron bed some time later.

Before being placed on the Clinitron bed, the patient is covered with a wet-drying dressing. Recently, we have been using dressings with hydrocortisone emulsion or, more often, with iodopirone (I). The child is placed on a conventional sheet above the Clinitron filtering screen. As a rule, we do not use any oil-cloth.

In the case of the grave condition of the child, urination is performed via a ureteral indwelling catheter. Later on, the nursing of the burned child is carried out by a nurse or by the child's mother who has received special instructions. The nursing using the Clinitron bed is relatively simple, there is no need to turn the child over.

The bed temperature is usually maintained at about 32—36 °C depending on the child's requirements and condition.

Children are tolerant to the air-pillow bed and to their following removal to the conventioned bed. Such phenomena as "intolerance" or "inactivity atrophy", often met among adults and accompanied by general astenisation, loss of the body mass, muscular loss, are very slightly manifested in children. And children can easily stand the changes of orthostatic load.

Of 79 children with circular burns and burns of the posterior surface of the body and limbs, who were treated using the air-pillow bed, 9 patients died. It should be repeated that these beds were used in the most complicated cases of critical or even life-incompatible thermal injury.

The results of the treatment of 23 patients who entered the Department with some delay, are of significance. The children were placed on the Clinitron beds when they already were in the septicotoxemic stage of the burn disease. In these patients, polymorphic pathogenic flora soon was changed for monomorphic flora. The most stable flora species were *Staphylococcus aureus*, *Pseudomonas aeruginosa* and, less often, *Proteus*. At the same time, clinical symptoms of toxicosis were rapidly and significantly reducing.

The Clinitron beds produce bacteriologically clean environment around the patient, provide a controllable microclimat. In the case of IIIa burns, a dry crust is formed after 8—12 hours, and epithelisation is completed by the 14—15-th day.

In the case of deep (IIIa—IV) burns, a dry crust is formed after 24—48 hours. Simultaneously, we perform a gradual chemical necrectomy on 5—10 % of the body surface.

After the crust has been removed, the wound is covered with a wet-drying dressing, and one or two days we perform autodermoplasty using a reticular graft. We preferably use reticular grafts with a width of 0,1—0,2, perforated with a ratio of 1 : 3.

The Clinitron air-pillow beds also facilitate rapid epithelisation of the donor wounds which is completed by the 4—5-th day, the donor wounds being covered, after the graft harvesting, with a Viniplene film. Rapid epi-

thelisation is of special importance if there is a shortage of the donor resources, as it permits to harvest skin grafts several times from the same site.

As a rule, burned children feel comfortable on the Clinitron beds. Their removal to conventional beds, even after a long period on the Clinitron, presents no complications.

Only four children under one year of age, during the first 24 hours on the Clinitron, showed unusual faccidity, and occasionally anxiety which could not be relieved using conventional doses of analgetics and neuroleptics. This made us to transfer these children to the conventional beds, then all the symptoms disappeared.

The rest of the children under 1 year of age (7 patients) felt comfortable on the Clinitron beds.

DISCUSSION

Treatment of the patients with burn injuries in the conditions of the controlled abacterial environment — in the rooms with laminar air-flow (2, 3, 6), in the rooms with infrared radiation (7) — presented a new stage in the local treatment of the burns. However, the use of these methods has not solved the problem of extensive circular burns and injuries mostly located on the posterior surface of the body. Conventional hard beds result in the trauma of granulations, secondary necrosis and deepening of the wounds located on the posterior surface of the body, in the significant dissemination of microorganisms and development of the decubitus (4).

To a large extent, this problem may be solved using the air-fluidised beds in the clinical practice of the burn treatment, the Clinitron beds. The authors have used these beds for 79 children in the age of 3 months up to 14 years.

The continuous circulation of dry air around the body of the patient on the Clinitron facilitated the rapid drying of the wounds, rapid epithelisation of the superficial burns and decreased periods of the wound preparation for autodermoplasty in the case of deep burns. After autodermoplasty, it prevented rejection and lysis of the replanted graft.

Treatment on the air-fluidised pillow beds prevents the occurrence of the elements of the secondary necrosis in the wound, and occurrence of decubitus which are often met in the burn children while contacting the conventional bed. As a rule, children can easily stand the Clinitron. Their transfer to the conventional bed, even after a long period on the Clinitron, presents no difficulties.

Thus, the management of children with deep extensive burns using the Clinitron air-pillow beds, is one of the effective ways to improve the results of the thermal injury, to prevent possible after-burn complications and to decrease mortality rate.

SUMMARY

2723 children were treated in the Burn Department of the Pediatric Clinical Hospital No. 9, Moscow, during 3 years (1986—1988), among them

1465 children being under 3 years of age. Since 1985, the Department has been using the beds of "Clinitron" type, 79 children (3 months — 14 years of age) with extensive burns having been treated on the Clinitron beds with air-fluidised pillows. During the treatment, the children received the usual therapy accepted in the Department. The use of the air-pillows beds promoted rapid drying of the wounds, accelerated epithelisation of the superficial burns, reduced the periods of the wound preparation for autodermoplasty for deep burns, prevented rejection and lysis of the replanted grafts.

Key words: thermal injury, burns in children, therapy of burns, "Clinitron" bed

RÉSUMÉ

Traitement de vastes brûlures chez les enfants

Astrosnikovová, S. P., Buletova, A. A., Vasiljevova, L. A.

Au Département des brûlures de la Clinique pédiatrique N° 9 à Moscou, on a traité 2723 enfants (dont 1465 de l'âge inférieur à 3 ans) au cours de trois années (1986 — 1988). Depuis 1985, le Département dispose des lits type „Clinitrone“ et 79 enfants, âgés de 3 mois à 14 ans, présentant de vastes brûlures ont été traités sur ces lits, équipés de coussins d'air. Les autres aspects du séjour à l'hôpital étaient conformes au traitement habituel. L'utilisation des lits aérés par les coussins d'air facilitait le dessèchement des plaies, accélèrait l'épithélisation des brûlures superficielles, raccourcissait la période nécessaire à la préparation de la plaie pour une autodermoplastie, exécutée habituellement après de vastes brûlures, et même empêchait au rejet ou à la lyse des greffons.

ZUSAMMENFASSUNG

Die Behandlung ausgedehnter Verbrennungen bei Kindern

Astroshnikova, S. P., Buletova, A. A., Vasiljevova, L. A.

Im Verlauf von drei Jahren (1986—1988) wurden an der Abteilung für Verbrennungen der Kinderklinik des Krankenhauses Nr. 9 in Moskau 2723 Kinder behandelt, darunter 1465 Kinder im Alter von weniger als drei Jahren. Seit 1985 wird an dieser Abteilung ein Bett des Typs „Clinitron“ benutzt, und 79 Kinder (im Alter von drei Monaten bis zu vierzehn Jahren) mit ausgedehnten Verbrennungen wurden unter Anwendung des Bettes „Clinitron“ behandelt, das mit Luftpolstern ausgestattet war. Ansonsten wurden die Kinder während ihres Aufenthalts an der Klinik mit der bei uns üblichen Behandlung betreut. Die Anwendung der Betten mit aufgeblasenen Luftpolstern verhalf zu einem raschen Austrocknen der Wunden, beschleunigte die Epithelisation der Verbrennungen an der Oberfläche, verkürzte die Zeit zur Vorbereitung der Wunde zur Autodermoplastik bei tiefreichenden Verbrennungen und verhinderte die Abheilung oder Lysis der Transplantate.

SUMARIO

El tratamiento de las quemaduras extensas en los niños

Astrozhnyikova, S. P., Buletova, A. A., Vasilyevova, L. A.

Durante tres años (1986—1988) en el Departamento de las Quemaduras, en la Clínica de Pediatría, Nú. 9, Moscú, fueron tratados 2723 niños, 1465 de ellos menos de 3 años. Desde el año 1985 este departamento ha usado la cama del tipo "Clinitron" y 79 niños (en la edad entre 3 meses hasta 14 años) con quemaduras extensas fueron tratados con ayuda de estas camas proveídas de los cojines inflatados con aire. Por lo demás, el tratamiento de los niños fue tradicional. El uso de estas camas ayudó a la deshidratación rápida de las heridas, aceleró la epitelización de las quemaduras superficiales, redujo el período de la preparación de la herida para la autodermoplastia, empleada después de las quemaduras profundas, así como impidió la reyección o lisis de los transplantes.

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APPLICATIONS OF ISLET MUSCULOCUTANEOUS FLAP FROM THE TRAPEZIUS MUSCLE FOR PRIMARY PLASTIC OPERATIONS OF ORAL CAVITY DEFECTS

J. G. MATYAKIN, A. A. UVAROV

Radical surgery for malignant tumours of the oral cavity (T_3 and T_4 degrees) appears to be the most effective method of treatment. This is performed either independently or in combination with previous radiotherapy. The postoperative survival time is taken as the basic indicator of the success of such treatment. Nevertheless, problems of the medical and social rehabilitation of the patients thus affected are no less important. Rehabilitation treatment of patients after destructive surgery for reasons of malignant tumour of the tongue, oral cavity floor and the alveolar prominence of the mandible, is the option many specialists prefer. The main role, however, is played by the surgeon who has to cover the resulting defect simultaneously with the operation. The use of diverse musculocutaneous grafts is the most effective mode of primary plastic operation. Such musculocutaneous flaps are lifted from the sternocleidomastoid, trapezius or pectoralis major muscles. Our communication is about the uses of the trapezius muscle musculocutaneous islet flap for the primary plastic operation on oral cavity defects.

There are several techniques of mobilization of the above listed transplants (1—6). We used the method of elevating a pedicled flap supplied from the superficial cervical artery and concomitant vein (2, 4). This technique attracted our attention because of its relative simplicity and because it does not necessitate changing the patient's position in the course of mobilization.

Mobilization of the flap for radical surgery on the neck (Fig. 1) started with skin incisions. In the lateral triangle connective tissue we mobilized the superficial cervical artery and vein from their origin up to the point of entry into the trapezius muscle. On the right, the artery rises from the truncus thyrocervicalis, on the left, from the subclavian artery. It is, as a rule, 7—10 cm long, sometime as much as 12 cm. Its diameter (usually 2—2.5 mm) is irrelevant there as the blood flow is adequate. The concomitant vein, which rises from the trapezius muscle, anastomoses with the subclavian vein and

runs parallel to the artery about 1.5–2 cm lower. The inside diameter of the vein is relevant as it must be no less than 0.4 cm. The length of the superficial vein is less important though for the mobilization of the flap a minimum length of 7–8 cm is needed. Underestimation of the last two factors may result in serious complications, including ischaemization of the musculocutaneous flap in the immediate postoperative period, due to thrombosis of the vein.



Fig. 1 Diagram of skin incisions for radical surgery and mobilization of trapezius myocutaneous flap. The flap pedicle makes use of the superficial cervical artery and vein.

The "trickiest" moment in the mobilization of the flap is exactly the adequacy of the lumen of the vein responsible for drainage. Thus, in 15 cases we had to dispense with the mobilization of the required flap owing to inadequate lumen of the vein, and use other methods of plastic surgery during the actual operation. So long as sufficiently large vessels were available, we lifted the musculocutaneous islet flap usually in the middle portions of the trapezius muscle. This was followed by a radical resection of the cervical tissue simultaneously with the removal of the oral cavity tumour. The flap was introduced underneath the levator muscle and fixed to the edges of the defect in the oral cavity. Then followed the introduction of a nasogastric tube and tracheostoma.

Simultaneous plastic surgery using the above described flap was performed in 13 patients. 12 suffered from squamous-cell carcinoma of various degrees of differentiation, 1 had a mucoepidermoid tumour. All the patients

with squamous-cell carcinoma had T_3 and T_4 grading, 8 of them had histologically demonstrated regional metastasis. 8 patients had the primary tumour in the tongue, 3 in the oral cavity floor, and 2 in the mucosa of the mandibular alveolar prominence. 12 patients had been treated with preoperative radiotherapy; 8 of them in doses ranging from 30 to 45 Gy, 4 in doses from 50 to 60 Gy and more, and 1 patient was irradiated postoperatively. It is to be noted that in 7 patients with the carcinoma of the tongue the volume of resection was usually the largest: subtotal resection involving the removal of practically the whole of the mandible. Partial necrosis of the flap was noted in 2 patients. The two complications followed a course depending on the type of thrombosis of the pedicle vein. On days 3 to 5, the skin component of the flap developed oedema, capillary return began to disappear and colliquation necrosis set in. In 1 case the flap covered the root of the tongue, in another the flap covered the defect after subtotal resection involving the removal of the mental segment of the mandible. Both complications arose from venous thrombosis. In the remaining eleven cases primary healing in the oral cavity was observed. In 2 patients there was partial dehiscence of the suture in the pedicle region. This, however, required no extra surgical intervention. No correlation was found between the number of complications and the dose of ionizing radiation. The average period of hospitalization ranged from 25 to 40 days. During that period no artificial feeding was needed, the cannula had been removed from the trachea, and logopedic rehabilitation could be started. For illustration we present the following case reports.

Patient D., 36 years, was admitted to our clinic on December 23rd, 1983, with carcinoma of the mandibular alveolar mucosa after a course of radiotherapy.

The tumour ($T_3N_0M_0$) had been diagnosed in November 1983 as keratosing squamous-cell carcinoma. Distance gamma therapy in doses of 44 Gy was dispensed from November 10th to December 12th, 1983. The tumour regression was less than 50 %. As the tumour spread, invading the anterior parts of the alveolar prominence of the mandible, the tumour was diagnosed as infiltrating the oral cavity floor and muscles of the septum.

On January 5th, 1984, electrocautery was used for the resection of the mandible from 6 to 6, tissues of the oral cavity floor with the muscles up to the hyoid bone and the lower portions of the tongue; bilateral fasciocapsular resection of the cervical tissues was carried out with simultaneous plastic operation on the defect by means of a musculocutaneous flap raised from right-sided trapezius muscle supplied from the superficial cervical artery and vein. Tracheotomy was performed. Healing proceeded by first intention. The nasogastric tube was removed on day 11, the cannula from the trachea on day 23 after the operation. The patient was released after 31 days of hospitalization with good functional and esthetic results. Replacement with ectoprosthesis followed in 6-month time (Fig. 2—4).

Patient M., 44 years, was admitted on February 27th, 1988, with carcinoma of the oral cavity floor mucosa ($T_4N_0M_0$).



Fig. 2 Patient D., 31 days after surgery — view from outside. — Fig. 3 The same case. 31 days post-operatively. The skin cover of the flap is visible in the anterior parts of the oral cavity.



Fig. 4 The same case at 6 months after surgery. Replacement with ectoprosthesis.

In December 1987 mucosal carcinoma $T_4N_0M_0$ had been diagnosed as squamous-cell cancer with keratization. At the place of his domicile the patient had received two cures of polychemotherapy with 5-fluorouracil, bleomycin, platijum — with no effect.

On admission: in the region of the lateral portions of the oral cavity floor on the left an ulcer carcinoma was found infiltrating the anterior two-thirds of the tongue, the mandible and muscles of the septum. The tumour was 8 by 4 cm in size. On March 5th, 1988, we performed subtotal electro-resection of the tongue, tissues of the oral cavity floor, mandible from 7 at an angle from the left followed by resection of the cefical connective tissues from the left with coverage of the defect by transposition of the musculocutaneous flap from the left-sided trapezius muscle pedicled on the superficial cervical artery and vein, tracheotomy. The oral cavity wound was healed per primam; partial dehiscence of the suture developed in the pedicle region. The tube was removed on day 29, the tracheal cannula on day 30. Owing to the proliferation of the tumour, radiotherapy was applied to the tumour bed and to the cervical region bilaterally using a dose of 44 Gy.

Distance gamma¹ therapy had no harmful effect on the graft transposed to the oral cavity (Fig. 5—7).

Transposition of the trapezius musculocutaneous flap provides suitable cover for defects in the oral cavity with good functional and esthetic results.

We prefer this technique of plastic surgery provided a sufficient pedicle is available. The flap mobilization gives the patient no trauma, the secondary defect is in all cases handled by primary suture. Moreover, no hair is likely to grow in the skin segment zone. This is quite important as the skin fragment of the flap gives rise to the oral cavity lining.

It should be noted that the uses of this type of plastic surgery has important limitations owing to the anatomical specificities of the pedicle structure. Hence, the above described flap could not be used in more than 50 % of the cases in our group.

The application of the method is useful in long-necked patients and also for covering defects localized mainly in the posterior parts of the oral cavity and oesophagus.

SUMMARY

13 patients after major resection of oral cavity malignancies had primary plastic operation performed using trapezius muscle musculocutaneous flaps to cover the defect. The flaps were mobilized on a vascular pedicle supplied by the superficial cervical artery and drained by the concomitant vein. Partial flap necrosis was seen in two patients — mainly due to thrombosis of the vein of the pedicle. The vein should have an inside diameter of at least 0.4 cm. In the remaining cases, satisfactory functional and aesthetic results were obtained. In the flap mobilization region there is, as a rule, no growth of hair, which is important as the skin layer of the flap provides the inner lining of the oral cavity.



Fig. 5 Patient M — 37 days after radical operation and plastic operation of the tongue defect, oral cavity base, mandible covered with a trapezius musculocutaneous flap.

Fig. 6 The same case. View from the left — partial dehiscence of secondary defect suture.

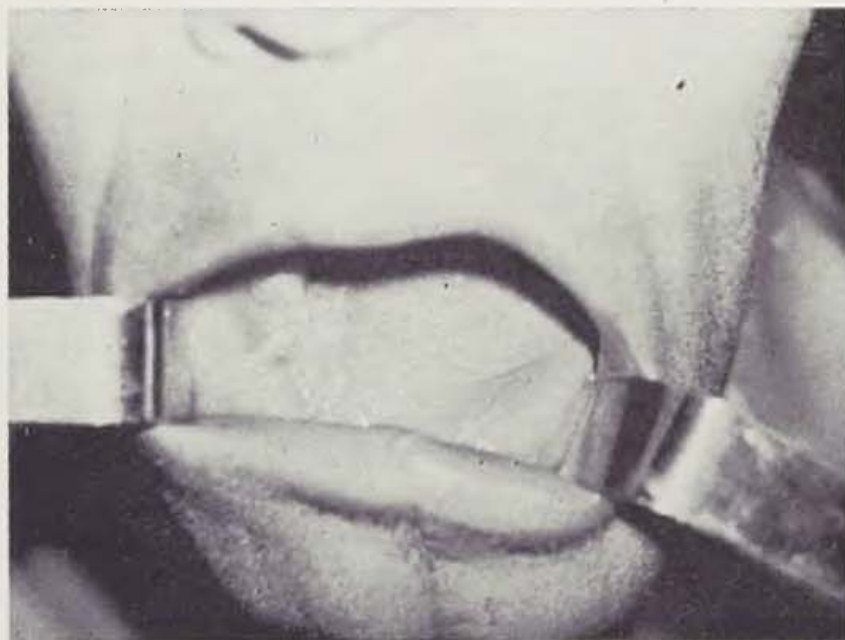


Fig. 7 The same case. Skin cover of the flap visible in the oral cavity.

RÉSUMÉ

Application du lambeau myocutané en îlot de trapèze en plastie primaire des défauts dans la cavité buccale

Matjakin, J. G., Uvarov, A. A.

Chez 13 patients, après de vastes exérèses des tumeurs malins localisés dans la cavité buccale, on a effectué une plastie primaire des défauts par un lambeau myocutané de trapèze. Le greffon a été mobilisé sur un pédicule contenant une artère et une veine cervicales. Chez deux malades, on a observé une nécrose partielle du lambeau dont la cause principale était une thrombose veineuse dans le pédicule. Le diamètre de la veine doit être au moins 0,4 cm. Dans les autres cas, on a obtenu de bons résultats cosmétiques et fonctionnels. Dans la zone de la mobilisation du lambeau, les cheveux ne poussent pas habituellement, ce qui est important, parce que c'est grâce au segment cutané du lambeau que le recouvrement intérieur de la cavité buccale est assuré.

ZUSAMMENFASSUNG

Die Anwendung eines „inselartigen“ Haut-Muskel-Lappens mit Anschluss des Trapezmuskels zur primären Plastik von Defekten in der Mundhöhle

Matjakin, J. G., Uvarov, A. A.

Bei 13 Patienten nach einer ausgedehnten Resektion der örtlich lokalisierten bösartigen Geschwülste der Mundhöhle wurde eine primäre Plastik der Defekte mittels eines Haut-Muskel-Lappens des Trapezmuskels ausgeführt. Der Pfropfen wurde am Stiel mit der Halsschlagader an der Oberfläche und der Vene mobilisiert. Bei zwei Patienten wurde eine teilweise Nekrose des Lappens beobachtet. Die Hauptursache war eine Thrombose der Vene im Stiel. Der Durchmesser der Vene muss mindestens 0,4 cm betragen. In den sonstigen Fällen wurden gute kosmetische und Funktionsergebnisse erzielt. In der Zone der Mobilisierung des Lappens kommt es gewöhnlich zu keinem Haarwuchs, was sehr wichtig ist, da man mit Hilfe des Hautsegments des Lappens die interne Ausbettung der Mundhöhle sichert.

SUMARIO

La aplicación del colgajo „islote“ musculocutáneo con ayuda del músculo trapecio para la operación plástica primaria por los defectos en la cavidad bucal

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Después de una resección extensa de los tumores malignos localizados en la cavidad bucal realizada en 13 pacientes se efectuó la operación plástica primaria por los defectos por medio del colgajo musculocutáneo tomado del músculo trapecio. La movilización del injerto se realizó en el pedículo con la arteria cervical superficial y con la vena. Dos pacientes tuvieron la necrosis parcial del colgajo. La causa principal de esto fue la trombosis de la vena en el pedículo. El diámetro de la vena tiene que ser al menos 0,4 cm. En los otros casos se lograron buenos resultados funcionales así como estéticos. En la zona de la movilización del colgajo generalmente no crecen pelos, lo que es importante porque el segmento cutáneo provee el epitelio de la cavidad bucal.

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The author's aim at standardizing the anatomical terms for each particular structure, their precise definition, and a comprehensive anatomical list of all types of hernia, i. e. inguinal, femoral, umbilical hernias, hernias in cicatricial tissue, after laparotomy, etc., as well as the best suited variants of their surgical treatment.

Part I discusses anatomical aspects in detail with precise definition of Gimbernati's and Cooper's ligaments and their interrelationship.

Part II gives a detailed description of the surgical techniques for different types of hernia. Each phase of the operation is always illustrated by instructive drawings, and, for the most part, peroperative photographs. There are also descriptions of different methods of application of Marlex meshwork for the treatment of

inguinal and cicatricial hernia. In conclusion the author describes the techniques of intestinal resection and anastomosis in cases of incarcerated hernia.

The book is supplemented with 2 appendixes concerned with outstanding figures of the history of the study of the anatomy and surgery of hernias.

Appendix I covers such 18th and 19th personalities as A. de Gimbernati, P. C. Camper, A. P. Cooper, A. Scarpa, F. K. Hesselbach, J. Cloquet and J. Gay. Appendix II entitled "Revolutionary era in the surgical treatment of hernias" deals with H. O. Marcy, E. Bassini and W. S. Halstedt. In every case there is a biography of the personality concerned, his contribution to the knowledge of hernia, and the portraits are supplemented with authentic quotations.

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ASSESSMENT OF DISINFECTANT TOPICAL AGENTS IN KERATINOCYTE CELL CULTURE GRAFTING TECHNIQUE IN SEVERELY BURNED PATIENTS

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INTRODUCTION

The success of grafting technique surgery with keratinocyte cell cultures in severely burned patients is multifactorial as reported by literature (5) (8).

From a microbiological point of view, the drawback which seems to limit the percentage of take of these cultures is burn wound sepsis.

In our opinion the above condition calls for the development of an accurate methodological programme including first of all the detection of the germs which more frequently colonize severely burned patients; second, the testing of the effectiveness of the various topical agents on them; third, the establishment of which one, of the topical agents able to destroy the contaminating bacterial species, shows a small degree of cytotoxicity to keratinocyte cell cultures.

MATERIALS AND METHODS

In compliance with the above outline we based our study on microbiological investigation carried out at the Burns Unit in Bari.

During a period of 18 months routine sampling were taken from the environment, the medical staff and severely burned patients (1).

All patients hospitalized since January, 1988 underwent routine bacteriological tests (surface swabs, urine cultures, culture tests of vein and urine bacteria) reserving more accurate tests (blood cultures, bioptic samples) to severely burned patients (burned surface 50 to 80 %).

The monitoring of sepsis agents found in the burn wounds relied on two different methods: the first is represented by full-thickness biopsies, weighed, diluted in 5 ml of simple broth and inoculated into plates, the second is the surface culture technique made with swabs streaked on the

wounds and subsequently put in 5 ml simple broth and then inoculated into diagnostic media plates (4).

When possible, the isolated bacterial strains were typed and their responsiveness to antibiotics was tested. The bacterial strains streaked in sterile agar tubes were kept to assess the efficiency of the different topical agents.

To this purpose some frequently used topical agents in clinical therapy were selected on the basis of their well-established effectiveness, of their uptake and toxicity at a systemic level.

They include: silver sulfadiazine (1 %), silver catadyn (1 gr. Ag in 10 gr powder), iodine compounds (Merbromina), 10 % iodine compounds (Braunol), centrimide chlorhexidine 0.15 %—0.015 %. (Table 1).

Table 1. Topical agents frequently used in clinical therapy

| Substance | Concentration |
|-------------------------|-----------------------------|
| Silver catadyn | 1 gr silver in 10 gr powder |
| Silver sulfadiazine | 1 % |
| Sodium merbromine | 2 % |
| Braunol | 10 % iodine |
| Cetrimide chlorhexidine | 0,015 %; 0,15 % |
| Sulphate gentamycin | 0,1 % |
| Rifampicin | 0,5 % |
| CAF | 1 % |

These topical agents were tested together with antibiotics often present in commonly used preparations such as sulphate, Gentamycin (0.1 %) Rifampicin (0.5 %) and CAF (1 %). The technique used for the antimicrobial susceptibility was the standard agar dilution method (3): a series of Agar Muller Hinton agar plates with experimental agents at a range of concentration from 1 to 100 $\mu\text{g/ml}$ in medium.

When fluid or powdered topical agents were used, the dilution was at first made in distilled water to obtain the established work concentration from which serial dilutions can be made.

Active substances were used for ointments (cream topical agents) with the exception of silver sulfadiazine that was also found to be soluble in distilled water.

Plates were superficially inoculated with an overnight broth culture of bacterial strains isolated and then kept at 37 °C for 18—24 h with some controls.

The value MIC was defined as the lowest concentration of the substance able giving no visible growth of the microorganisms tested after incubation.

It is to be emphasized that this test was relied on concentrations 1,000 times lower than the one of the product. This was done in order to evaluate the

effectiveness of low-concentration topical agents (100 $\mu\text{g/ml}$) that were thought to be compatible with our culture and histological needs.

The topics selected i. e. the ones able to destroy Gram (-) and Gram(+) bacterial species, underwent cytotoxicity assays (2).

Keratinocyte cell cultures on the top, recently obtained in our laboratory, were incubated with silver catadyn (50 $\mu\text{g/ml}$) and cetrimide chlorhexidine (25 $\mu\text{g/ml}$) with three controls.

Removed the culture medium containing the topical agent, the cells were tripsimized and re-seed at low cell density and under normal growth conditions.

After fifteen days the cultures without medium were stained with Rhodenile b. (a specific dye for keratinocytes) and the colonies were counted.

The colony forming efficiency (C. F. E.) was assessed comparing the colonies present during the tests with those grown in the controls with a 100 % C. F. E. (7).

RESULTS

The environmental microbiological evaluation showed that the most frequently germs isolated from the environment, shown by table 2 are: *S. aureus* (70 %); *Acinetobacter* (8 %); *P. aeruginosa* (8 %); *Proteus* spp. (4 %); *E. coli* (3 %); KES group (7 %).

The incidence of positive cultures from biopsies ($\geq 10^4$ -microorganisms/gr) and wound surface cultures is 90 %. A prevalence of *P. aeruginosa* (60 %) emerged if compared to *S. aureus* (30 %) and to other bacterial species: *Proteus* spp. (11 %); *E. coli* (3 %), KES group (2 %) (Table 2).

In particular, the characterization of various strains of *Ps. aeruginosa* emphasized the presence of two multiresistant serotypes 11 and 12 that colonize most patients.

Table 2. Germs isolated from the environment of the burns unit

| | | | |
|---------------|-------|---|------|
| St aureus | 70 % | Positive cultures from biopsies and surface swabs | 90 % |
| P, aeruginosa | 10 % | | |
| Acinetobacter | 8 % | | |
| Proteus spp, | 4 % | | |
| E coli | 3 % | P. aeruginosa | 60 % |
| Klebsiella | } 7 % | S, aureus | 30 % |
| Enterobacter | | Proteus spp, | 4 % |
| Serratia | | Other Gram-5 | 6 % |

In conclusion it can be stated that the bacterial flora contaminating environment of our Burns Unit and the burn wounds of severely burned patients could be traced back to two pathogenic species: *S. aureus* among Gram(+) and *P. aeruginosa* among Gram(-). (-)

Our investigation uncovered a certain activity of the frequently used agents at different concentrations (range from 1 to 50): sulphate Gentamycin

MIC < 10 $\mu\text{g/ml}$; silver catadyn and silver sulfadiazine active at 50 $\mu\text{g/ml}$ on the whole bacterial species.

On the contrary CAF and iodine compounds are inefficient (MIC > 100 $\mu\text{g/ml}$), the latter being known for their toxicity against tissues (tab. 3).

Table 3. Results of sensitivity tests of 102 bacterial strains carried out with MIC method

| Topical agents tested | | Number of strains with MIC ($\mu\text{g/ml}$) equal to: | | | | |
|-----------------------|-----------|---|----|----|-----|------|
| | | 1 | 10 | 50 | 100 | >100 |
| Sulphate gentamycin | (0,1 %) | 22 | 22 | 29 | 3 | 26 |
| CAF | (1 %) | 0 | 0 | 0 | 0 | 102 |
| Sodium merbromine | (2 %) | 0 | 0 | 27 | 32 | 43 |
| Cetrimide | (0,15 %) | 4 | 30 | 20 | 1 | 47 |
| Chlorhexidine | (0,015 %) | | | | | |
| Povidone | | | | | | |
| Iodine | (10 %) | 0 | 0 | 0 | 0 | 102 |
| Rifampicin | (0.5 %) | 27 | 0 | 0 | 25 | 50 |
| Silver catadyn | | 0 | 1 | 91 | 9 | 1 |
| Silver sulfadiazine | (1 %) | 0 | 0 | 61 | 40 | 1 |

Table 4 reports the frequency of resistance to the tested topical agents (MIC > 100 $\mu\text{g/ml}$) of different bacterial strains per species.

It is to be emphasized that different topical agents are efficient against *S. aureus* with the exception of CAF, iodine and rifampicin, whereas against Gram(−) only silver catadyn and silver sulfadiazine are efficient particularly in the case of *P. aeruginosa* that is known for its multiresistance to hospital environments.

On the basis of these data, which suggest a higher sensitivity to silver catadyn of the various bacterial strains, we tried to test the possible cytotoxicity of this topical agent and of cetrimide chlorhexidine which is efficient against *S. aureus*.

Preliminary results show an 80 % colony forming efficiency C. F. E. for 1 h tests with silver catadyn (50 $\mu\text{g/ml}$). Cetrimide chlorhexidine (0.25 $\mu\text{g/ml}$) shows a 90 % C. F. E.

Additional studies are underway to determine DL 50 that is the dose inducing a 50 % reduction of the ability to form colonies over controls.

CONCLUSIONS

Clinical practice in other Burns Unit and in ours has shown that the take of keratinocyte cell cultures used in the reconstruction surgery on seven young severely burned patients (affected body area: 70 %) selected for the intervention is 30 %–40 %.

Table 4. Frequency of resistance to the different topical agents (MIC >100 $\mu\text{g/ml}$) of 102 bacterial strains subdivided for species

| Bacterial species tested | N° of strains examined | N° strains with MIC >100 mcg/ml of | | | | | | | |
|-------------------------------|------------------------|--------------------------------------|-----|-------|------|--------|------|------------|----------|
| | | Genta | Caf | Merbr | Cetr | Iodine | Rifa | Silv. cat. | Sil, MIC |
| <i>Staphylococcus aureus</i> | 52 | 0 | 52 | 2 | 0 | 52 | 27 | 0 | 0 |
| <i>Pseudomonas aeruginosa</i> | 30 | 24 | 30 | 29 | 29 | 30 | 7 | 0 | 0 |
| <i>Proteus morganii</i> | 5 | 2 | 5 | 4 | 5 | 5 | 3 | 0 | 0 |
| <i>Proteus mirabilis</i> | 2 | 0 | 2 | 2 | 2 | 2 | 0 | 0 | 0 |
| <i>E. coli</i> | 5 | 0 | 5 | 2 | 4 | 5 | 5 | 0 | 0 |
| <i>Klebsiella pneumoniae</i> | 3 | 0 | 3 | 2 | 3 | 3 | 3 | 1 | 1 |
| <i>Enterobacter cloacae</i> | 3 | 0 | 3 | 2 | 3 | 3 | 2 | 0 | 0 |
| <i>Acinetobacter</i> | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| <i>Citrobacter</i> | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |
| Total | 102 | 26 | 102 | 43 | 47 | 102 | 50 | 1 | 1 |

The study aims at improving this result by means of a programme of control, prevention and treatment of infections through a targeted drug therapy.

Since keratinocyte cell cultures are at present the most reliable solution in the field of reconstruction surgery, even if with some limitations, our experience leads us to emphasize the importance of a close cooperation among laboratory workers, clinicians and surgeons.

Actually, laboratory trials can suggest solutions improving presently used techniques or can even help work out new alternatives.

SUMMARY

On the basis of previous experiences and of international literature data the authors emphasize the importance of making a "targeted" choice of the topical disinfectant in the therapy of burn wound infections.

The objective of the investigation is to reach the highest rate of take of the autologous keratinocyte cultures in burn wounds.

RÉSUMÉ

Evaluation des moyens de désinfection dans les techniques transplantatrices sur les cultures de kératinocytes chez les grands brûlés

Dioguardi, D., Barbuti, S., Calvario, A., Brienza, E., Larocca, A. M. V.

Se basant sur leurs expériences préalables et sur les données de la littérature internationale, les auteurs soulignent l'importance d'un choix visé de moyens locaux de désinfection dans le traitement des plaies infectées. Le but de leur recherche était l'augmentation du nombre des cultures autologues greffées de kératinocytes qui s'installent dans les blessures du brûlé.

ZUSAMMENFASSUNG

Die Bewertung örtlicher Desinfektionsmittel bei der Transplantationstechnik von Keratinozyten-Kulturen bei schweren Verbrennungen

Dioguardi, D., Barbuti, S., Calvario, A., Brienza, E., Larocca, A. M. V.

Auf Grund früherer Erfahrungen und Angaben der internationalen Literatur unterstreichen die Autoren die Wichtigkeit einer gezielten Auswahl örtlicher Desinfektionsmittel bei der Behandlung infizierter Wunden. Ziel der Forschung war es, eine Steigerung der Anzahl der sich in der Wunde des Verbrannten fangenden Kulturen autologischer Karatinozyten zu erzielen.

SUMARIO

La evaluación de los desinfectantes locales aplicados en la técnica de transplatación de los cultivos de los queratinocitos en los enfermos con las quemaduras graves

Diogardi, D., Barbuti, S., Calvario, A., Brienzo, E., Larocca, A. M. V.

A base de sus experiencias y los datos de la literatura internacional, los autores destacan la importancia de la selección de los desinfectantes que se aplican en el tratamiento de las heridas infectadas. El objeto de la investigación fue aumentar la cantidad de los cultivos de los queratinocitos autólogos en la hereda del quemado.

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To sum up, the author treats his subject with great erudition and interest. The publication is objective, easy to survey and well integrated. The illustrations and photographs are attractive as well as instructive. The monograph provides a comprehensive view of the problems involved in the anatomy of and surgery for hernias and although the range of methods

is relatively narrow the book is a valuable material mainly for young surgeons.

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THUMB RECONSTRUCTION USING FREE FLAP TRANSFER

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Progress in microsurgical technique has produced a number of new and very effective surgical procedures for the reconstruction of the thumb. The standard approach using the tubed flap with subsequent implantation of an autologous bone graft remains the method of choice in some indicated cases. For partial restoration of sensitivity it is possible, in the next stage, to transpone a neurovascular island flap from a threephalanx finger. Post-operative care of a tube-flap patient places great demands on the patient and the attending personnel alike. Bone graft implantation is followed by further reduction and modelling of the flap. Transposition of a sensitive flap should ensure feeling at the tip of the reconstructed thumb. The stage-wise treatment results in sufficient opposition between the threephalanx fingers. The course of treatment, however, takes one year to be completed.

The authors' effort was to replace this procedure by a single-time operation. they cover the transplanted bone graft with a freely transferred radial artery flap (forearm flap, Chinese flap). In indications of this kind, the forearm flap offers a number of advantages. It can be mobilised in an entirely irregular shape "to fit" and has a thin layer of fine subcutis and a sufficiently long vascular pedicle. Last but not least, it can be transferred as a sensitive flap innervated by the final branch of the musculocutaneous nerve.

The authors would like to present some details of the surgical procedure. Prior to operation, they make an exact drawing of the excision in the region of the stump (Fig. 1), and then, on a soft piece of shapable material, a drawing of the free flap guided by the length and approximate circumference of the contralateral thumb. The model is then copied on the forearm. In the peripheral part of the flap, they leave a falciform cusp to cover the tip of the reconstructed thumb (Fig. 2). The operation is performed simultaneously by two surgical groups. The bone graft taken from the iliac crest is fixed with traction cerclage. This provides a compressive and very stable osteosynthesis (Fig. 3a, b). The mobilized flap pedicle contains the radial artery with comitant veins, the cephalic veins and n. cutaneus antebrachii lateralis (Fig. 4). The following step consists in the free transfer with adaptation of the soft tissues

of the flap around the bone graft. The recipient vessels are the wrist vessels of the same name. They always perform anastomosis of the comitant veins, when possible, of the cephalic veins. Interfascicular suture of the sensitive nerve of the flap with branches rami superficialis n. radialis supplying the thumb represents the next step (Fig. 5).

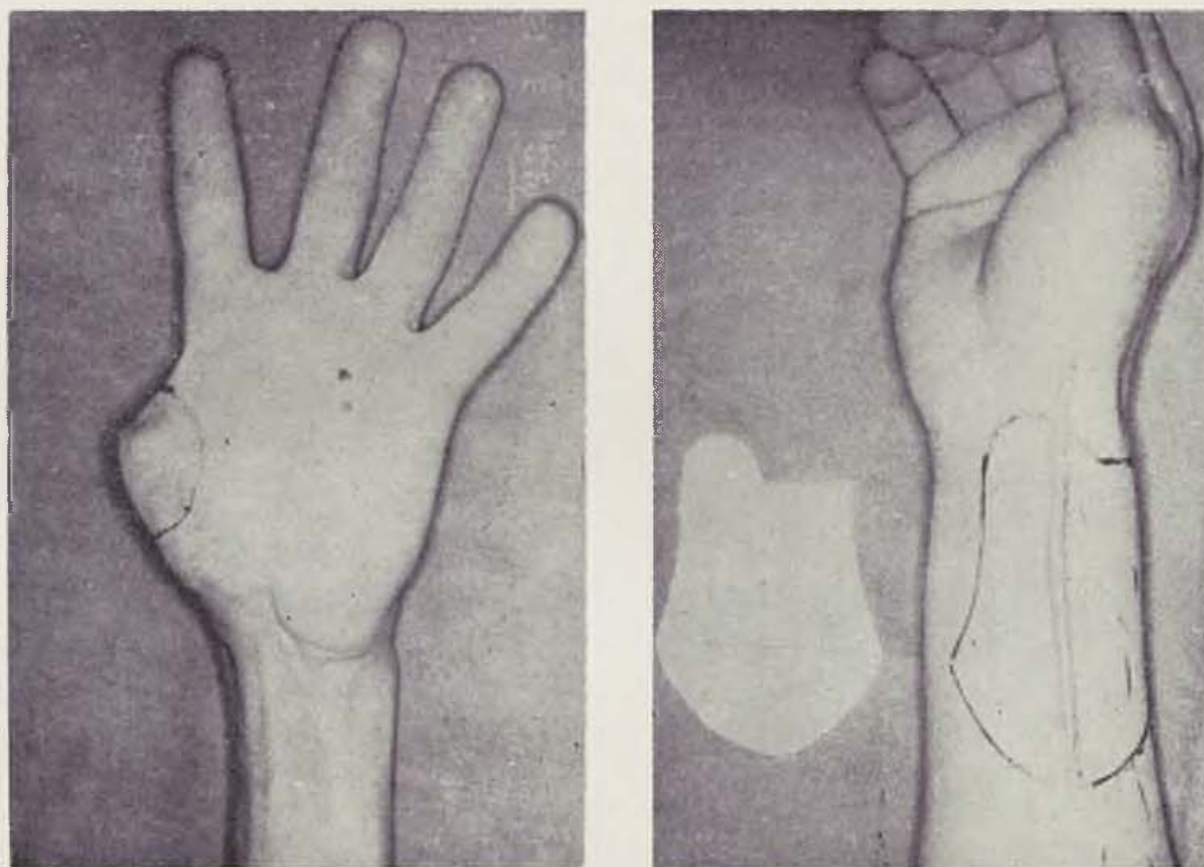


Fig. 1 Extent of excision in the region of the stump — Fig. 2 Model and preoperative drawing of free radial artery flap

CASE REPORTS

1. A 21 years old patient suffered avulsion of the right hand thumb (Fig. 6a). Attempted replantation failed. Four days after the removal of the necrotic replant, the authors carried out the reconstruction of the thumb, using a 8cm long bone graft, and transferred a free flap of the required shape 10×9 cm in size (Fig. 6b, c). The proximal fragment of the stump was made up of one half of the first metacarpal bone. The postoperative course was uneventful. The patient was released 20 days after the operation (Fig. 6d, e).

2. A 17 years old patient, working on a hop-picking machine, sustained a right-hand injury. His hand was drawn into the rotating picking wires. The result was devastating, tissue loss injury with multiple open fractures of metacarpal bones I—III, interruption and avulsion of the tendon apparatus



Fig. 3 a, b Traction cerclage provides for stable and compressive osteosynthesis

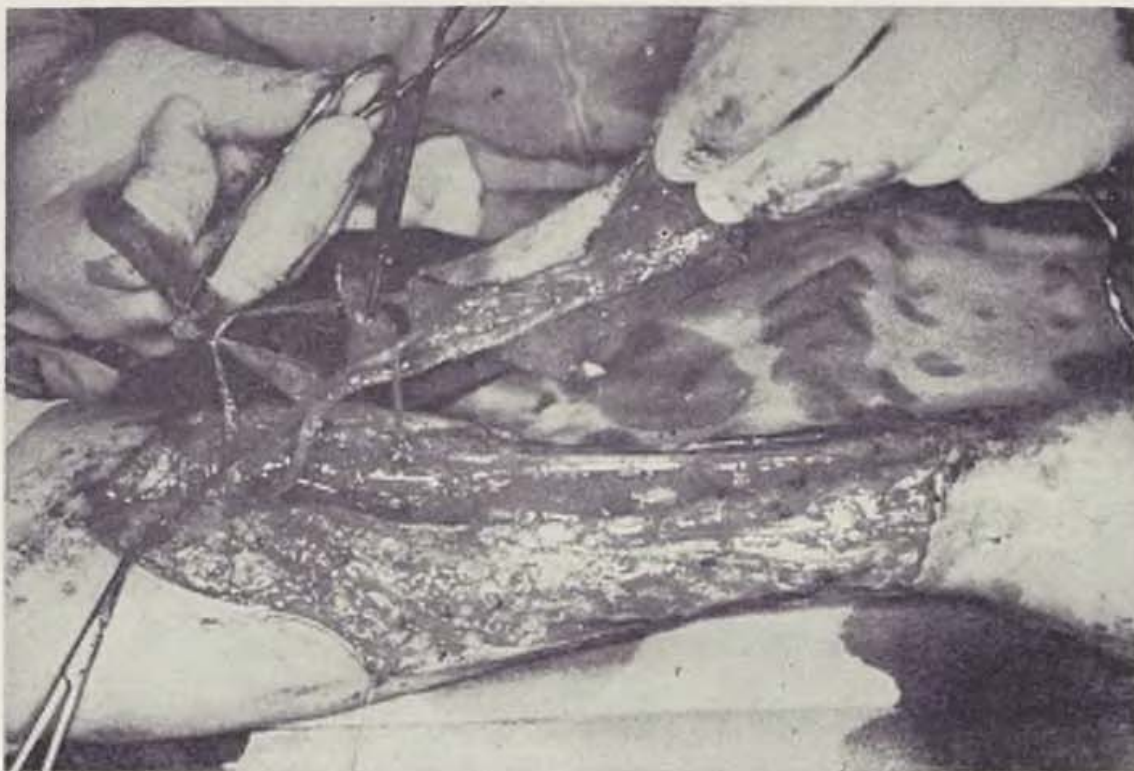


Fig. 4 Mobilized pedicled flap prior to raising



Fig. 5 Early postoperative state

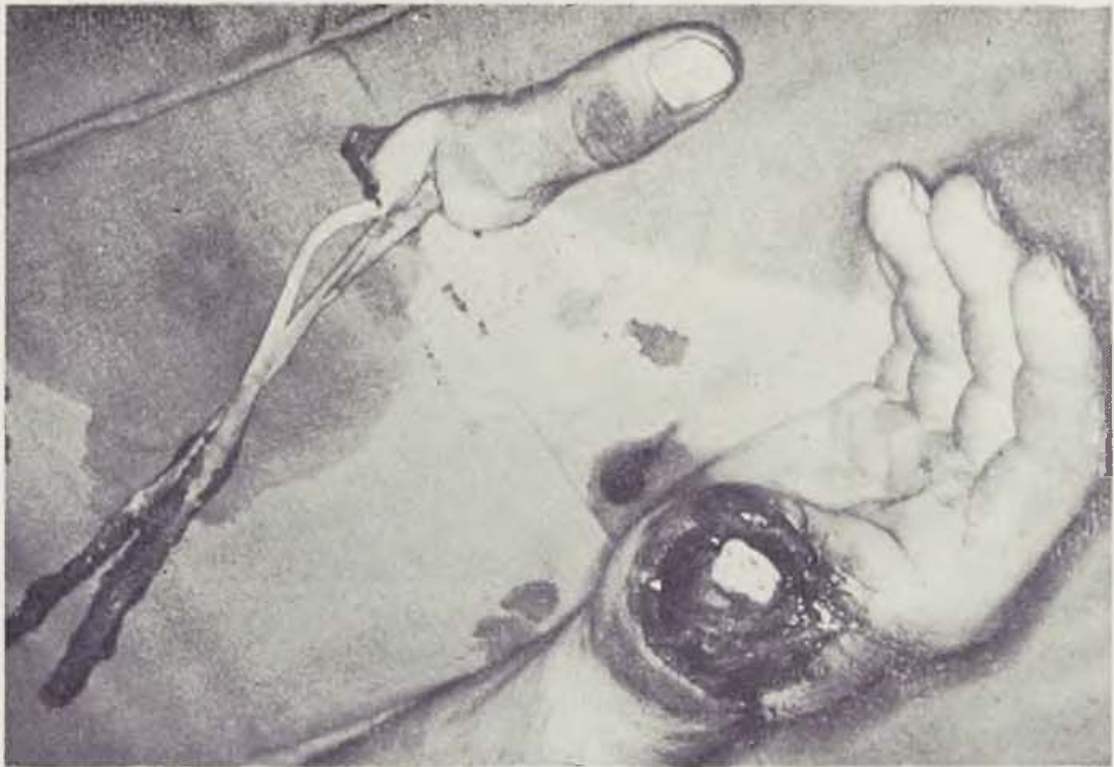


Fig. 6 a 1. Patient (21 years) after thumb avulsion



Fig. 6 b State before reconstruction

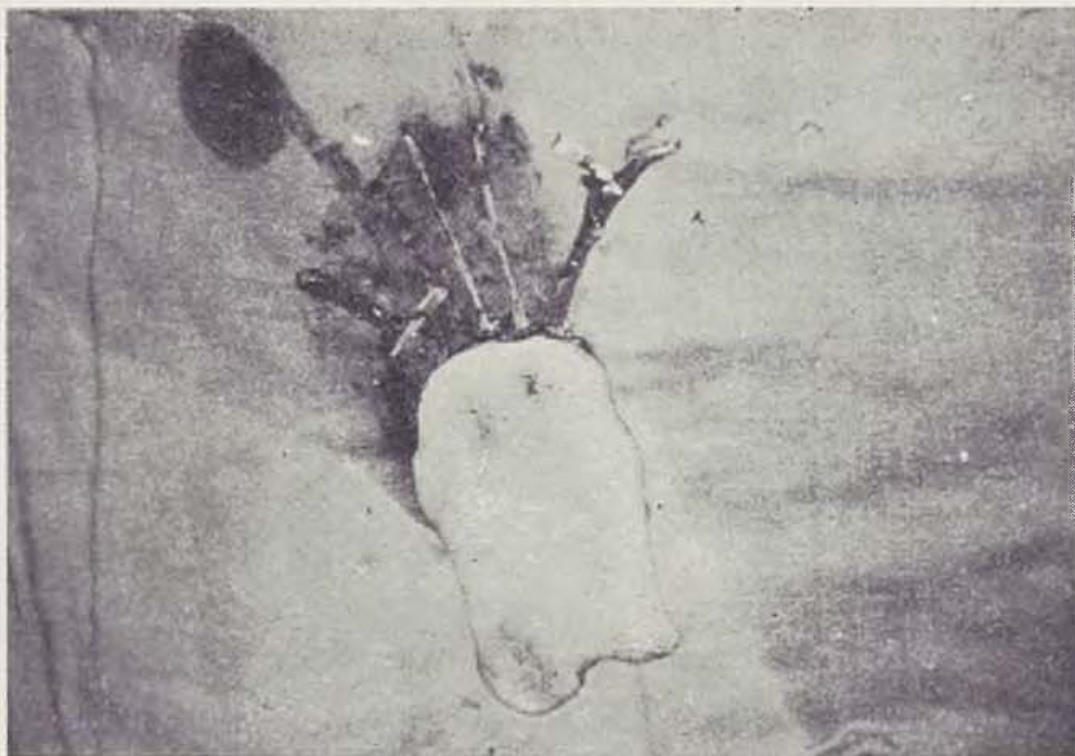


Fig. 6 c Free flap after separation

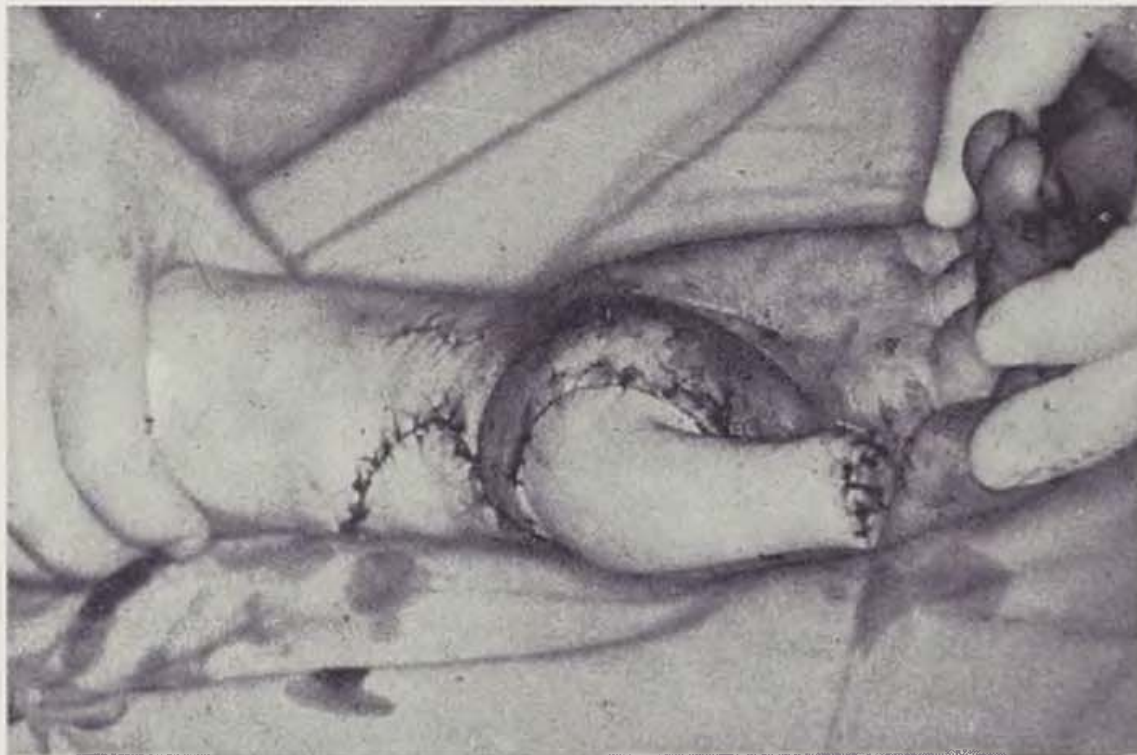


Fig. 6 d State shortly after surgery



Fig. 6 e State after healing

and a subtotal amputation of the thumb at the level of metacarpal bone I (Fig. 7a). Primary treatment was followed by osteosynthesis, suture and reconstruction of the tendons and an unsuccessful attempt to revascularise the thumb. The patient was released for domestic care. Four months later, after the fractures were healed and his threephalanx fingers were rehabilitated, the patient was readmitted for thumb reconstruction (Fig. 7b). Osteosynthesis between the 8 cm long graft and the base of metacarpal bone I was performed by means of traction cerclage. The soft tissues were supplemented with a flap of $7,5 \times 13$ cm in size. The postoperative course presented no complications, and on the 21th day postoperatively, the patient was released (Fig. 7c, d).

3. A charge of unknown provenience exploded in the hand of a 47 years old patient, devastating his left hand and causing denudation of metacarpal bones I—III and dislocation of all metacarpal bones in the carpometacarpal articulation. The skin cover remained preserved on digits 4 and 5 (Fig. 8a). During primary treatment, the authors' effort was to preserve digits 4 and 5 and the region of the opposition in the form of the denuded thumb. With metacarpal bones II and III removed, interdigital space I was filled with the remaining soft tissues (Fig. 8b). On the 5th day after admission and the subsequent full compensation of the patient's general condition, they transferred a free radial artery flap to the defect resulting from denudation of the thumb and the thenar region (Fig. 8c, d, e). In the subsequent course, flap perfusion was



Fig. 7 a 2. Patient (17 years) with right hand injured in hop-picking machine

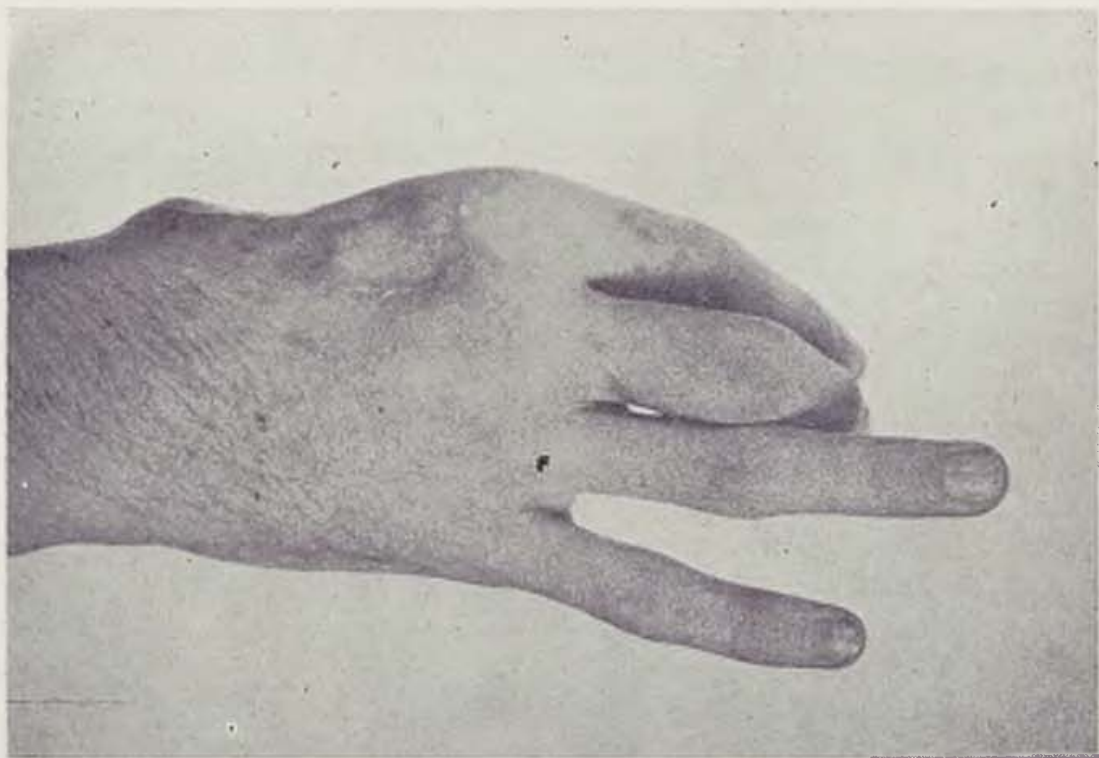


Fig. 7 b State before thumb reconstruction

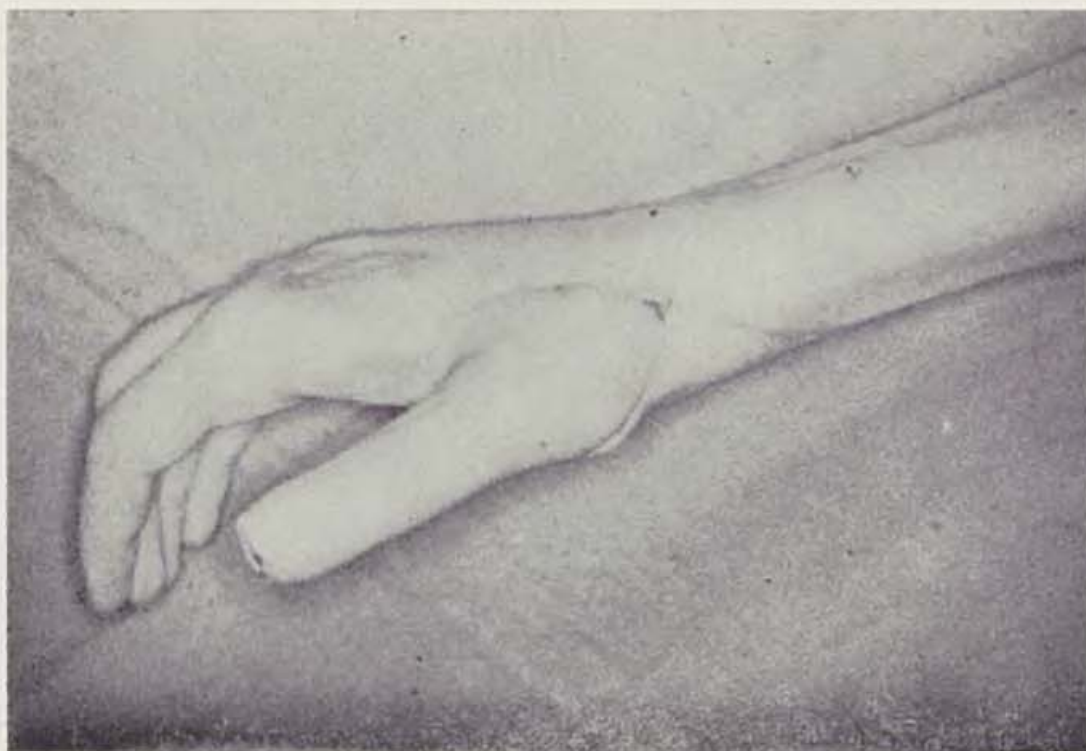


Fig. 7 c State after reconstruction



Fig. 7 d Donor area after healing

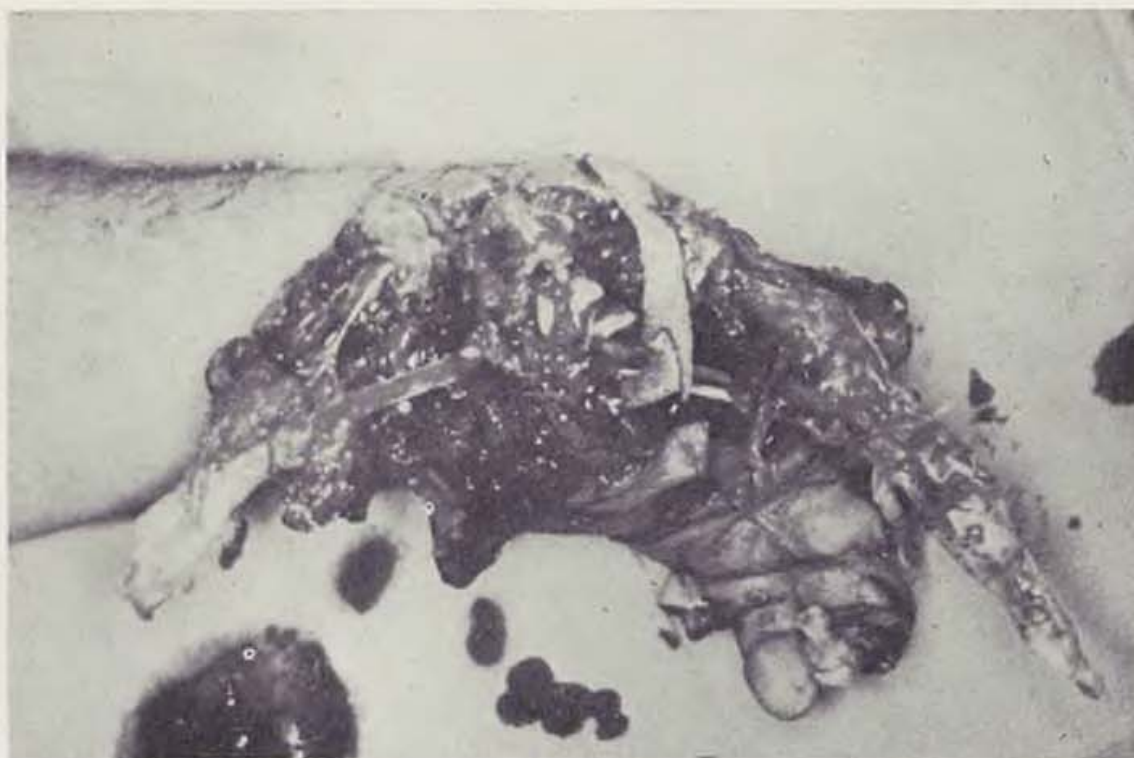


Fig. 8 a 3. Patient (47 years) — injury caused by explosive



Fig. 8 b State before defect coverage with free sensitive flap

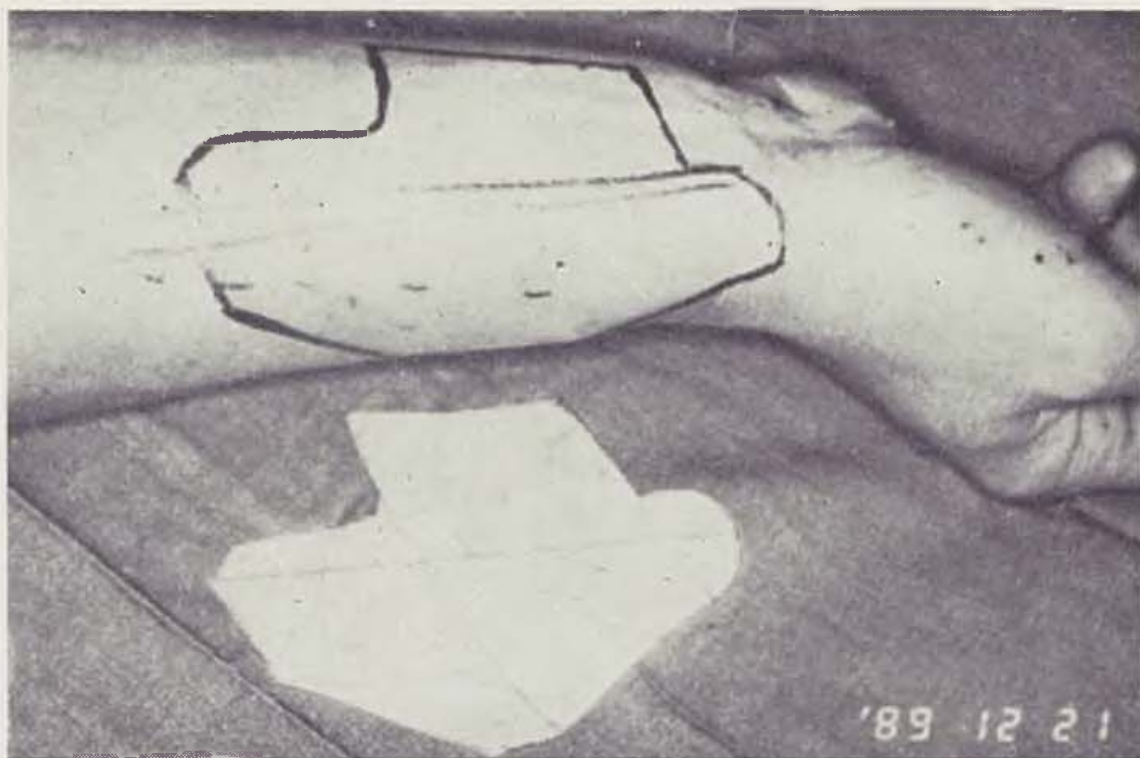


Fig. 8 c Model and drawing of free flap on forearm

without complications. Coverage with a free flap facilitated adequate dressing of the injured hand, inclusively considerable elevation. After 51 days of hospitalization the patient was released for home care and for out-patient rehabilitation care (Fig. 8f).

CONCLUSIONS

With the exception of one circumscribed necrosis in the tip of a reconstructed thumb, $1 \times 1,5$ cm in size, which was removed, there was no need for any considerable shortening of the bone implant. In all four patients, healing proceeded without complications. No flap perfusion disorder was noted. The experience, however, is still too short. The operations were performed at intervals of 4–6 months. The reinnervation of the flap reaches a discrimination distance of 1,5–2,5 cm. It can be assumed that the traction cerclage providing sufficient immobilisation and compression of the contact-surface between the graft and the bone of the hand, along with well perfused-tissue of the free flap, represents the proper condition for the rebuilding restitution of the bone graft. The single-time operation, as presented, is an advantage in comparison with the above described standard approach. The flap is satisfactory, as to its shape, and requires no further modellation. Each time within four months after the operation sensitivity was restored throughout the reconstructed thumb, and is now topically identical with the pre-traumatic state, i. e., the patient feels the flap tissue as his own original



Fig. 8 d, e State shortly after transfer



Fig. 8 f State after healing

thumb. Other advantages are (1) the quality of the grasp and (2) the reduced risk of skin cover traumatization. Further, (3) a good estimate of adequate load for the reconstructed thumb is assured. It can be assumed that after bone graft reconstruction and removal of traction cerclage, which often immobilizes the carpometacarpal articulation, the reconstructed thumb will provide good opposition to the threephalanx fingers.

SUMMARY

The authors present a choice of thumb reconstruction method using free transfer of sensitive radial artery flap together with autologous bone graft implantation in a single-time operation. They regard this approach as more advantageous than the standard tubed flap techniques. The advantages are the following: 1. single-time operation, 2. flap tissue sensitivity, and 3. satisfactory shape of the reconstructed thumb, requiring no subsequent modelling. Photographs show the surgical procedure and three other casuistics.

RÉSUMÉ

Reconstruction du pouce par transmission du lambeau libre

Nejedlý, A., Tvrdek, M., Kletenský, J.

Los auteurs présentent les possibilités de reconstruction du pouce par la transmission du lambeau sensitif libre a. radialis avec l'implantation d'un greffon osseux autologue

en un temps opératoire. Ils trouvent ce procédé plus avantageux en comparaison avec la méthode classique du lambeau tunnelisé. L'avantage consiste surtout en intervention à un temps, en sensibilité des tissus du lambeau en toute étendue, et en une forme satisfaisante du pouce reconstruit, qui ne nécessite pas de remodelage ultérieur. Les photographies témoignent le procédé opératoire du cas décrit et encore des trois autres cas.

ZUSAMMENFASSUNG

Die Rekonstruktion des Daumens mittels eines frei übertragenen Lappens

Nejedlý, A., Tvrdek, M., Kletenský, J.

Die Autoren legen die Möglichkeit vor einer Rekonstruktion des Daumens mittels der Übertragung eines freien sensitiven Lappens a. radialis und der Implantation eines autologen Knochenpfropfens zu gleicher Zeit. Sie erachten diese Methode als günstiger, im Vergleich zur klassischen Lösung mittels eines tubulisierten Lappens. Der Vorteil ist die Ausführung zu gleicher Zeit, die Empfindlichkeit des Lappengewebes im ganzen Umfang, sowie die entsprechende Form des rekonstruierten Daumens, die keine weitere Modellierung erfordert. Photographien dokumentieren den operativen Vorgang, sowie drei weitere Kasuistiken.

SUMARIO

La reconstrucción del pulgar con ayuda del colgajo libre

Nejedlý, A., Tvrdek, M., Kletenský, J.

Los autores presentan la posibilidad de la reconstrucción del pulgar por medio de un colgajo sensitivo de a. radialis con la implantación del injerto óseo autólogo en un tiempo. Este método lo consideran como el más ventajoso en comparación con la técnica tradicional, que usa el colgajo tubular. La ventaja consiste en la intervención quirúrgica efectuada en un tiempo, la sensibilidad del completo tejido del colgajo y en la forma conveniente del pulgar reconstruido la, que no necesita ningún otro modelado. Las fotografías muestran la técnica operatoria y otras tres historias médicas.

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ARTHROPLASTY FOR MAJOR DEFECTS OF ARTICULAR AREAS OF FINGERS

M. BROZMAN, J. JAKUBOVSKÝ

Surgical treatment for major defects of articular areas in small joints of the hand requires an individual approach which, according to the origin and extent of the damage, depends on the choice of surgical technique and use of relevant materials.

Arthrodesis, resection arthroplasty, articular replacement and free transplantation do not always bring satisfactory results which would stabilize the joint, remove pain, lead to sufficient movement capacity, allow normal joint loading without degenerative effects, and which would not interfere with the growth potential in children and adolescents. Thus the surgical treatment of articular defects of the hand remains a moot question.

After Skoog et al. (1972) confirmed the chondrogenic potential of the perichondrium, new possibilities arose as regards surgical treatment for articular defects of fingers. The experience of the Swedish specialists suggests that the articular reconstruction with perichondrial tissue could be a promising technique mainly because autogenous, easily available material can be used and the surgical technique is not complicated. However, this reconstructive technique was more concerned with metacarpophalangeal articular repair using implanted flat or hemispheric implant (Engkvist et al., 1975; Skoog and Johansson, 1976; Ohlsen, 1978; Engkvist and Johansson, 1980).

Our paper will be concerned with the movement of the proximal interphalangeal joint (PIP) in cases of major articular damage involving also bone tissue. Only minimum attention has yet been paid to this rather narrow topic in our as well as foreign literature.

MATERIAL AND METHODS

In 1976—1987, the Department of Plastic Surgery, Bratislava, provided treatment for 43 patients with ankylosis of the proximal interphalangeal joint of the hand. Out of this number, 38 patients had defects of the PIP joint of one finger, while 5 patients had defects on 2 fingers.

In 35 patients, the most common cause of the defect was trauma (injuries caused by circular saw, milling cutter, planing machine and by other means). 10 joints were found to suffer from an extensive loss of articular areas. The joint damage was simultaneously accompanied by cicatricial changes on the skin and subcutis. There was only an indication of the PIP joint movement or its movement was substantially impaired.

X-ray examination of the ankylotic joint was made for more accurate diagnosis. The result partially helped us to find the cause of the impaired articular movement pointing either to changes in the periarticular space or in the joint proper. Our control group of patients comprised only those patients whose X-ray showed deep intraarticular changes.

Surgical reconstruction was performed only after the reparative processes due to trauma had ended and after an intensive rehabilitation treatment or after repair of obstructive scars at the site of a planned operation.

SURGICAL TECHNIQUE

The articular areas of the PIP joint were approached from the dorsal side. This procedure enabled us to mobilize the skin cover, revise the extensor mechanism and to obtain an easy access to the articular areas, in particular, by means of mobilizing the central strip of the extensor and partial discission of the lateral ligament. With the joint opened, and the fibrocartilaginous or resected osseous form of ankylosis mobilized, we modeled a configuration of the future articular areas.

The perichondrium was removed out of the cartilaginous part of the 6th and 7th ribs, 12—14 mm broad and 4—5 cm long. The perichondrium connected with the costal cartilage was inserted into the articular space and fixed with Dexon suture to the edges of the resected areas. Inbetween we placed a silicone plate so as to fit the shaped articular areas. The joint was closed layer by layer.

Following surgery, the finger was immobilized in a semi-flexion position for 5—6 days. After that period we continued with active and passive exercises under the supervision of the therapist and physician.

MORPHOLOGICAL FOLLOW-UP

For the purpose of assessing transformations of the transplanted perichondrium by means of a light and electron microscopy, we excised small samples from the reconstructed articular areas over a period of 3—6 months and after one year — simultaneously with the removal of the silicone implant.

If a secondary articular reconstruction was needed, we took samples even after a longer period — in 4—8 years.

The tissues were treated in a standard way — using the paraffin technique — and assessed from sections stained with hematoxylin eosin or after fixation

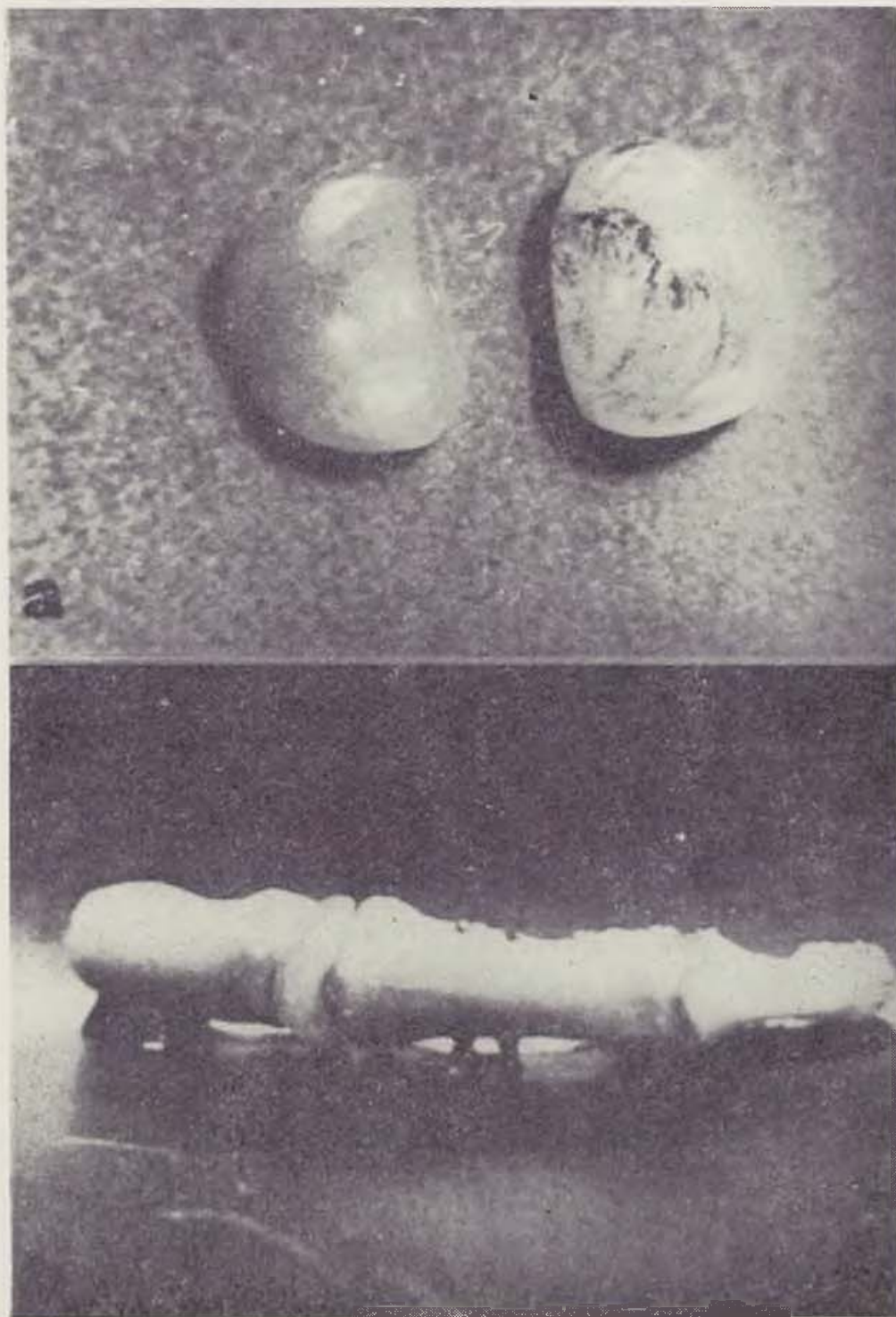


Fig. 1 a) modelled silicone implant — b) implant inserted between articular areas.

with glutaraldehyde and $O-O_4$, or also in the presence of ruthenium red embedded in Durkopan ACM according to the producer's direction (FLUKA

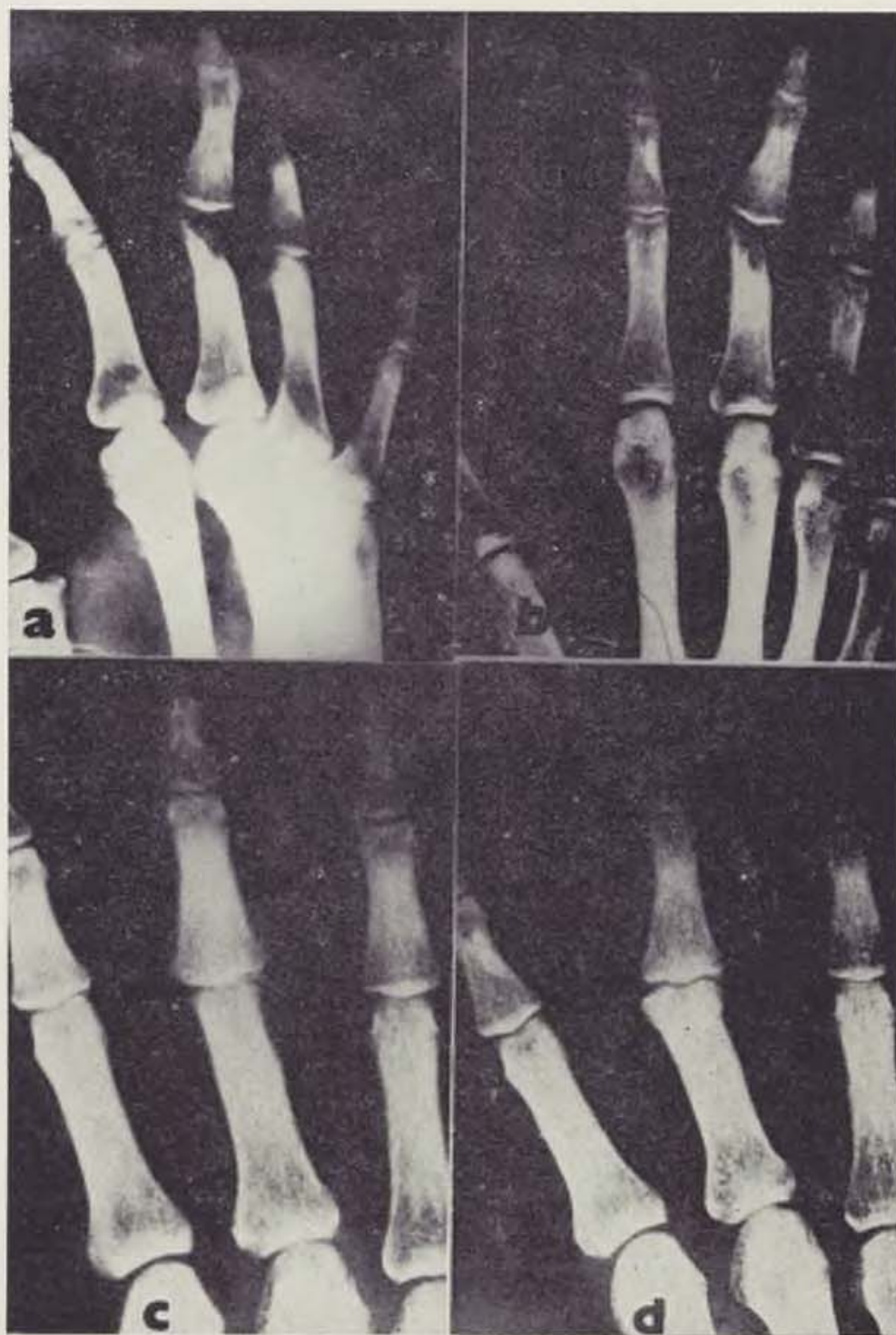


Fig. 2 a) injury of head of the proximal phalanx of the IIIrd finger caused by planing machine — b) condition seen a year after injury — c) a year after transplantation of the perichondrium and implantation of the graft — d) 3 years after articular reconstruction with perichondrium and implant.

AG., Busch, Switzerland); the semi-thin sections (Brozmanová et al., 1976) or thin sections were evaluated by counterstaining with uranyl acetate or lead citrate.

RESULTS

In patients with deep articular damage involving osseous tissue, where the use of silicone plate had previously failed to succeed, we applied an implant which we shaped so as to match the configuration of articular areas of the respective joint (Fig. 1).

Using silicone implant thus shaped we attained better results, especially in extensively deformed articular areas where the tissue losses involved even bone tissue (Fig. 2).

The shaped silicone implant helped to model the articular areas as the shape of the implant facilitated and simultaneously defined the form of the newly-constructed areas and helped to fill in the defects. In this way, it assisted in modelling the adequate form of the new joint, which ensured a sufficient range of movement of the reconstructed joint (Fig. 3).

In the postoperative period, the roentgenogram showed a gradual formation of the articular areas and filling of the defect with new tissue. This reconstruction may have also been stimulated by the transplanted perichondrium. We followed the dynamic process of the reconstruction and the adaptation of the joint and bone tissue to the external as well as internal demands placed on the reconstructed joint during long-term follow-up, i. e. from 2—10 years. During the removal of the implant, the articular areas were evaluated macroscopically. All of them showed smooth, white and glossy areas, which resembled normal cartilage (Fig. 4).

HISTOMORPHOLOGICAL RESULTS

Morphologically, the implanted perichondrium can be characterized as a connective tissue envelope situated all over the costal cartilage, consisting of collagen connective tissue, thinner connective tissue formed by small arteries, arterioles, capillaries, venules and veins. Sporadically, the perichondrium contained some adipose cells, perivascular mastocytes and myelinated nerve fibres. The borderline between the perichondrium and cartilage was not clear enough. The main cellular elements are the fibrocytes whose longer axis lies parallel to the surface of the cartilage. Under certain circumstances, three layers in the perichondrium could be distinguished; however, their borderlines were not distinct enough, and for our purpose this division had no practical use.

3—6 months following the implantation, the site of the implanted perichondrium showed a rigid-elastic connective tissue whose surface facing the articular cavity followed the surface, passing through the layers of collagen tissue which contained slightly undulating collagen fibrils and fibrocytes, their longer axis lying parallel to the surface. These cells occasionally appeared to be swollen but the rounding process had not yet developed. In

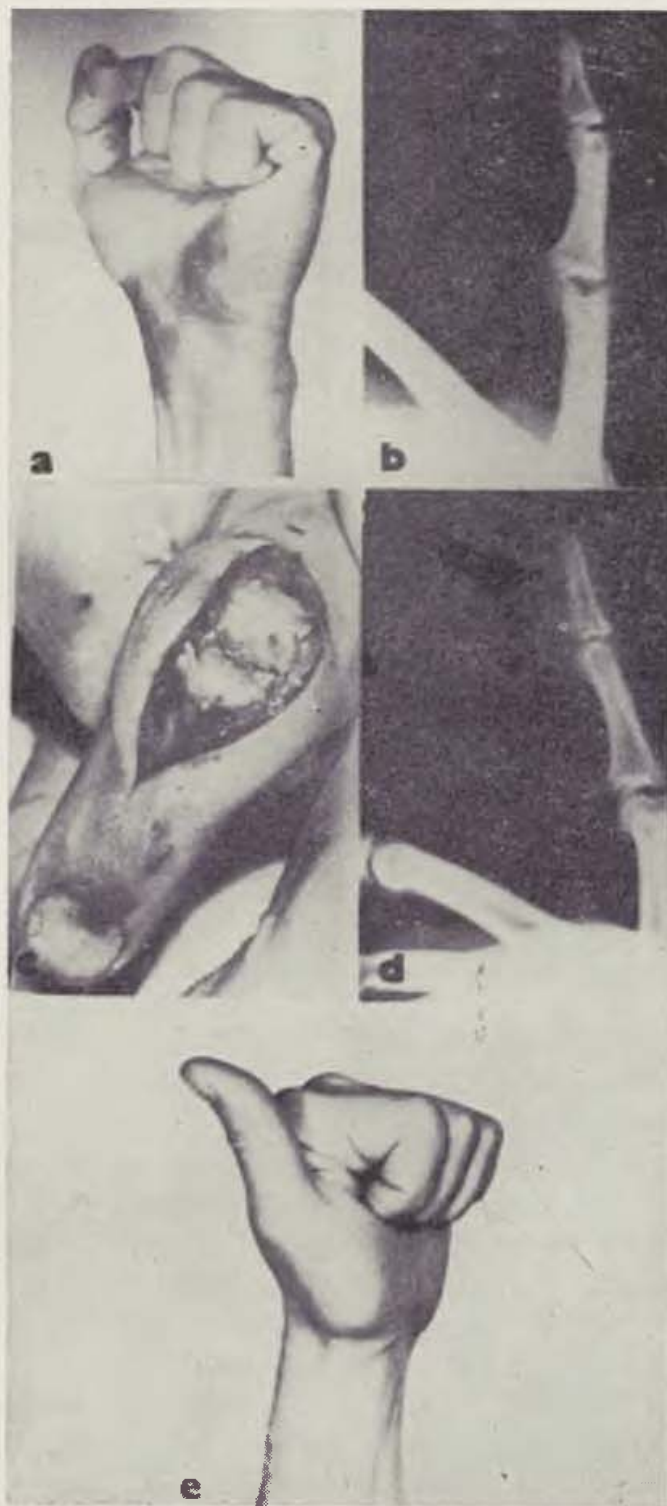


Fig. 3 a) functional state after PIP articular injury of the IInd finger caused by circular saw — b) defect of head of the proximal phalanx of PIP joint with osteofibrous changes and ankylosis — c) condition after resection and articular area formation covered with perichondrium — d) condition after 2 years with visible defect filling and configuration adjustment of articular area — e) functional results after 2 years.

deeper layers under the surface, the structural arrangement was slightly disoriented. The electron-microscopic findings showed signs of activated metabolism and synthetic function. The structure of collagen in no way resembled the structure of the fibrous component of the cartilaginous matrix. Only sporadically, using ruthenium red, it was possible to identify structures

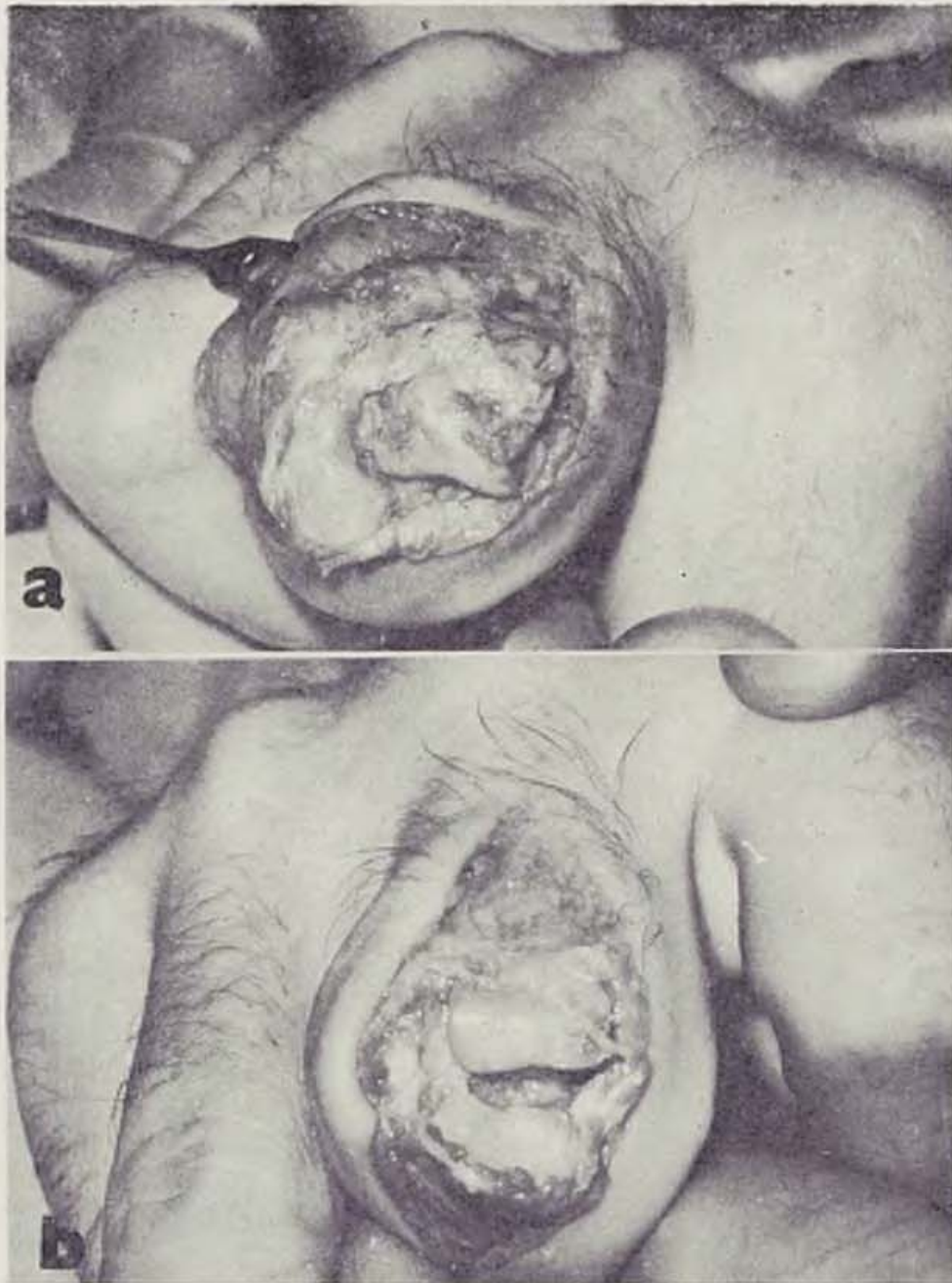


Fig. 4 a) defect of articular areas after accident — b) condition after 1 year following transplantation of the perichondrium and after removal of the implant (white, glassy surface).

resembling proteoglycans after fixation. Sometimes, we found deposits of polygonal cells resembling whorled structures and central condensation of cells. Some samples taken in this period were markedly vascularized. No original structures of the perichondrium were found (adipose cells, mastocytes and myelinated nerve fibres), or were an exception.

A year following the implantation, our results showed a growing frequency and size of the foci of hyalinization, in which the cell-rounding process varied. In some instances the trabeculae of the hyalinated fibres were acellular. Sporadically, we found cells resembling chondrocytes in imperfectly formed cellulae but never were they arranged in typical columns. The articular surface consisted of a smooth or slightly undulating area, at first sight acellular. On more detailed examination, however, the area was covered with short cytoplasmatic cellular projections of a "more fatty appearance", polygonal character, frequently occurring in small groups.

The cells in the deeper tissular layers between longer cytoplasmatic projections contained spherical, considerably photo-refractive material. The disorientation in the cellular structure was even more pronounced. Some parts showed an arcade-like arrangement of collagen connective tissue.

After a year, there was an increase in hyaline tissue, an irregular occurrence of chondrocyte-like cells but still no typical hyaline cartilage.

Only after 8 years following the implantation, a considerably thick layer of hyaline cartilage was found in the cartilaginous surface. Under this layer there was still fibrous connective tissue. The hyaline matrix contained foci of chondrocytes surrounded by cellulae, and even chondrocytes arranged into columns running parallel to one another (Brozman et al., 1988).

DISCUSSION

Morphological study of the perichondrium receives little particular attention in world literature. In contrast to this, the cartilage proper is well reported on even in Czechoslovak literature, particularly by Horký (1985).

The transformation of the transplanted perichondrium into the cartilage was mainly studied by Skoog et al. (1972, 1975), Engkvist and Ohlsen (1979), Engkvist and Johansson (1980), Ohlsen and Widenfalk (1983). These authors described the aetiology of hyaline cartilage in much earlier stages after implantation of the perichondrium than we did. In our opinion the reason was that our study described the technique of semi-thin tissular sections embedded in the epoxy bitumen. The above authors used the classical examination method of paraffin blocks which are substantially thicker and preclude an adequate use of the light microscope power of discrimination.

Using the criteria for cartilage characterization proposed originally by Schwann (1836, cit. Person, 1983) and Virchow (1859, cit. Person, 1983), we can, in an attempt to decide whether or not the perichondrium-produced material is a cartilage — reach the following conclusions:

1. As early as in initial phases of production, the newly-formed tissue is composed of cells or groups of cells suspended in a more or less solid matrix with a varying cell-matrix ratio.

2. The cells participate in the synthesis of extracellular matrix which, however, takes as long as 8 years after transplantation to resemble the hyaline cartilage matrix at least partly.

The cartilage can be characterized according to a number of different criteria. From the viewpoint of our microscopic and topographic criteria the transformation of the perichondrium can be characterized as an articular cartilage, first of the connective tissue later of the hyaline types.

However, the validity of any definition and the resulting classification is limited by the structural level of the particular observation concerned. Therefore Moss-Salentijn (1983) considers all types of classification relative.

In practice, we have been largely facing the problem of managing movement in a rigid painful joint of the hand which can be caused by injury, infection, local or systemic disease, or by congenital causes. This problem is very difficult to cope with as we know that no method can ensure to restore articular movement to full extent (Peimer et al., 1987).

The aim of our study was to restore movement in PIP joint with loss of cartilage or even bone, especially of one articular area. Hosuhang et al. (1984) referred to the inadequacy of this method for major articular defects. Nevertheless, we performed arthroplasty of the PIP joint in patients with much more extensive damage due to posttraumatic changes involving even loss of bone tissue. In reconstruction, we mostly worked with autogenous tissue — perichondrium which should meet the maximum demands of functional restoration, and to a lesser extent, act as supportive tissue (Skoog, 1972; Ohlsen, 1975; Engkvist and Ohlsen, 1979).

In our opinion, the method of arthroplasty using perichondrium, compared to others, seems to be more physiological, as it aims at maximum tissue preservation and takes into account the natural biological transformation of the perichondrium into the cartilage tissue (Ohlsen, 1976; Brozman, Jakubovský, 1984, 1988). Moreover, according to our observation, the result of arthroplasty seems largely to be influenced by the shape of the applied implant. It proved successful even in cases with articular damage with bone tissue loss. The implant conditioned and defined the shape of the newly-modelled articular areas. Together with the perichondrium it helped to form the correct shape of the joint. During the first days, this implant fixed the perichondrium well and permitted early passive changes in the position of the joint. Using the perichondrium and shaped implant, we achieved sufficient articular movement, loss of pain and articular stability, especially in younger patients.

SUMMARY

The costal perichondrium is a suitable material for the reconstruction of major damage to articular areas even bone tissue in small joints of the hand.

A modelled silicone implant conditions and simultaneously defines the shape of the reconstructed areas. Together with the perichondrium reconstruction, it helped to fill the defect and for a suitable shape of the articular areas.

Morphological findings of the perichondrium transformation showed a steady growth and a rising frequency of hyalinization of larger foci containing chondrocyte-like cells. After 8 years the cartilage surface showed a thick layer of hyaline cartilage.

Key words: proximal interphalangeal joint, perichondrium, shaped silicone implant, hyalinization

RÉSUMÉ

Arthroplastie de vastes défauts des surfaces articulaires des articulations digitales de la main

Brozman, M. Jakuboský, J.

Le péricondre costal représente un matériau convenable aux reconstructions de vastes lésions destructives des surfaces articulaires et du tissu osseux sur de petites articulations de la main. L'interpositum en silicone préformé conditionne et détermine en même temps la forme des surfaces articulaires reconstruites. Prenant sa part à la transformation du péricondre, l'interpositum participe au comblement du défaut et à la reconstruction de la forme convenable des surfaces articulaires.

Après un recul d'un an et plus, nous pouvons caractériser les changements morphologiques du péricondre par l'apparition des foyers d'hyalinisation de plus en plus fréquents et plus grands, avec les cellules ayant l'air des chondrocytes. Après 8 ans, à la surface du cartilage nous trouvons une couche massive du cartilage hyalin.

ZUSAMMENFASSUNG

Die Arthroplastik bei ausgedehnten Defekten der Gelenkflächen der Finger der Hand

Brozman, M., Jakubovský, J.

Das Perichondrium der Rippe ist ein geeignetes Material für Rekonstruktionseingriffe bei ausgedehnten Destruktionen der Gelenkflächen bis zum Knochengewebe an den kleineren Gelenken der Hand. Das geformte Silikon-Interpositum bedingt die Form der neugebildeten Gelenkflächen und begrenzt sie gleichzeitig. Unter Anteilnahme des Umbaus des Perichondriums wirkt es gemeinsam auf die Füllung des Defekts und bildet eine geeignete Form der Gelenkflächen.

Die morphologischen Befunde der Änderung des Perichondriums nach einem Jahr und später lassen sich charakterisieren als das Erscheinen immer häufigerer und grösserer Lager von Hyalinosis unter dem Auftauchen von Zellen, die an Chondrozyten erinnern. Nach acht Jahren findet man an der Oberfläche der Knorpel eine mächtige Schicht hyalinierter Knorpel.

RESUMEN

Artroplastía por los defectos extensos en las zonas articulares de los dedos

Brozman, M., Jakubovski, Y.

El pericondrio costal es un material adecuado para la reconstrucción del perijunto más extenso de las zonas articulares incluyendo el tejido óseo en las articulaciones menores del mano. El implante formado de silicón determina y al mismo tiempo demarca la forma de las áreas articulares reconstruidas. Los hallazgos morfológicos encontrados en la transformación del pericondrio después de un año mostraron un crecimiento continuo y una frecuencia creciente de los depósitos extensos de la hialinización con la células que se parecían a los condrocitos. Después de 8 años la superficie del cartílago mostró una capa espesa del cartílago hialoideo.

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Personal column

Prof. MUDr. Helena Pešková, DrSc. — to Her Jubilee

Professor Helena Pešková, Head Emeritus, Teaching Hospital of Plastic Surgery in Prague, celebrated her 80th birthday on September 5, 1990, full of optimism and enthusiasm.

On the occasion of this jubilee I am glad to have the opportunity to underline Professor Pešková's contribution to the progress of Czechoslovak plastic surgery and to prosperity of the international journal *Acta Chirurgiae Plasticae*.

Professor Pešková was born on September 5, 1910 at Slatina, Klatovy district, as a daughter of a teacher. In 1929, after secondary schools in Horažďovice and Prague, she entered the Faculty of Medicine, Charles University, Prague, and her graduation ceremony was held on February 11, 1935. Already during her studies she met Professor Burian who lectured at the Charles University in Prague on the grounds of plastic surgery at the 1st teaching hospital of surgery, and she was impressed by his, at that time generally unknown and newly born, plastic surgery, and thus her way of her medical development was found.

In 1937, after having finished the basic training in surgery, Professor Pešková entered Professor Burian's teaching hospital and remained faithful to him and to the workplace he had founded for the rest of her active life.

She greatly helped to develop plastic surgery in Czechoslovakia, she took part in elevation of Burian's department of plastic surgery to the university teaching hospital and in 1953 she and Professor Burian founded the department for burns, the first large independent department of this type on European continent. On March 3, 1970 she became Head of the teaching hospital of plastic surgery, Charles University, Prague, and she held this post till she retired on October 10, 1975.

Professor Pešková held important posts of Czechoslovak medicine, at the Institute of Post-Graduate Studies of Medicine and in the Medical Association of J. E. Purkyně.

After Professor Burian's death, Professor Pešková became the Editor of *Acta Chirurgiae Plasticae* and she held this post till the year 1988.

Professor Pešková has been indefatigable not only at her clinical work, when teaching and doing research, but also the list of her publications is enormous. Besides many articles in Czech and in foreign languages and as a co-author of five books, she wrote two important full-length studies: *Tubed Flap According to Filatov* (SZN 1955) and *Plastic Surgery of Aesthetic Deformities* (SZN 1986, published also in the Russian translation). The latter publication is a unique piece of work dealing with pathology and surgical treatment of all typical cosmetic deformities, and has become an invaluable source for studies of plastic surgery.

Dear Professor Pešková, on behalf of all Czechoslovak plastic surgeons, editors and readers of *Acta Chirurgiae Plasticae*, I am happy to wish you all the best and many happy returns.

prof. MUDr. M. Fára, DrSc

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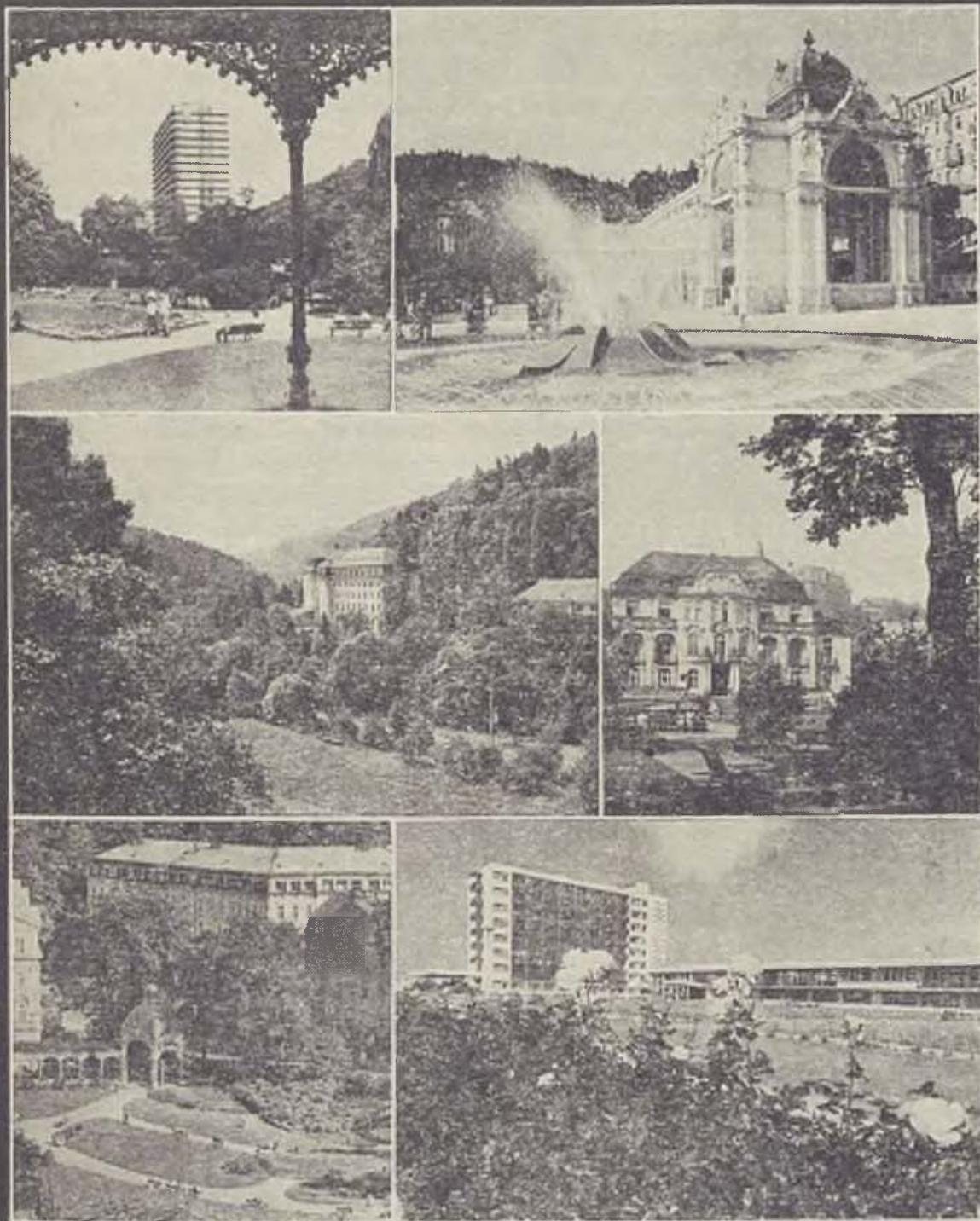
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