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The influence of technical appliances on the motoric and psychical development of children with deficient upper extremities.

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Within a period of 25 years (1951 - 1975) 81 patients with deficient upper extremities were registered in the Orthopaedic Clinic of Karl-Marx-University, Leipzig. They were from one to fifteen years of age. The number of new patients was approximately equally distributed into the years. The relation of congenital anomalies to amputations is 2 to 1. 56 of them received an artificial limb at the Department of Technical Orthopaedics of the same clinic. Figure 1 shows the numbers concretely. It can be supposed, that there is no larger contingent of patients in other centers in DDR. The indication for prosthetic fitting was always determined by an orthopaedist after a consultation with the parents and a technician. The whole artificial limbs and parts of them were preliminarily demonstrated. All the children, that received a prosthesis were reviewed regularly by a consultation team, including an orthopaedist and a technician. In relation to the extent of habituation and changes appearing with the growth of the patients, the same experts were taking the decision of a new fitting and its kind.

There were used baby plastic mittens in the first two years of age, conventional cable-powered prostheses with hook or active hand and cosmetic prostheses. Artificial limbs with electric, pneumatic or hydraulic motors were not applied.

45 of the 56 patients received prostheses without movement - predominately cosmetic prostheses - and 11 of them with active joint movement.

All the children with an unilateral arm anomaly had a limb-residue or an amputation-stump, which served for some activities. Only 3 of the 15 patients had severe bilateral anomalies - amelia or similar conditions and needed and used an unilateral active cable-powered prosthesis.

The child with deficient extremity must be able to live its childlike life as much as possible and to develop normally in respect to motoric activity, mind and psychical and social behaviour.

In order to decide, in which manner the optimal results could be achieved, a follow-up examination was carried out in 1977 by Dr. Scherzer and the author.

All the children were living with their families.

70 of the 81 patients attended for examination. Moreover, questionnaires were sent to the parents and the teachers. 2 of the remaining 11 children had died. 9 rejected the examination.

Under these conditions we obtained the following results:

However prosthetic fitting would be undertaken only, if it could be surely expected, that the parents were convinced of the necessity of using an arm-prosthesis, 11 of 56 artificial limbs had not been used some weeks or months after fitting. These are nearly 20%. It concerned 7 cable-powered and 4 cosmetic prostheses.

Reasons for declining of cable-powered prostheses are

- unsatisfactory function
- discomfort
- striking appearance
- easy damage.

In the time of follow-up examination all the 3 patients with severe bilateral arm defects were using their cable-powered prostheses, but only one of the 8 patients with an unilateral defect, which had been fitted with such a prosthesis was using it. Compared to it, 95% of the prostheses without active joint movement were used. Nearly all the patients were using their "cosmetic prosthesis" for simple activities and assisting the normal arm. Therefore the wear-out is very exposed.

Reasons for using so called "cosmetic prostheses" are

- lack of complications
- good appearance
- low weight
- assisting function

In childhood the physical activity is more frequent but less complicated than in adults. Therefore, the artificial limb for unilateral deficient arm must be simple, durable and of satisfying appearance. By reason of our experience in fitting of adults with myoelectric prostheses I believe, that these prostheses are not suitable for children before about 12 years of age.

We stated that there was no influence of technical appliances on the general motoric development. There was no distinctive retardation compared with normal children.

We investigated also the spine of all the 66 children with unilateral deficient upper extremity by x-rays. We found a slight scoliosis in 9 patients without relation to prosthetic fitting or not and to the kind of it. It could not be proved, an influence on the static development of the spine. The mental development of the child is very important, because it needs to learn a profession in future, requiring predominantly mental capacities. Based on informations from the teachers, parents and own investigations we stated, that there was no influence of technical appliances on the mental development. Empathy of parents and teachers is much more important.

The compassionate attitude is injurious. Mental requirements must be higher in comparison with these for children with two normal hands. According to our opinion, it is no right to raise false hopes with the development of new technical appliances like a "super-prosthesis" in future. Therefore we insist on visiting an ordinary school. All the children in our contingent are doing so and all of them go successfully through with it every year. There were more children with mental capacities ~~below~~ above than below the average.

The prostheses have a favourable effect on the psychical development and on the development of a normal social mode of behaviour. They overcome successfully the existing disturbances. Psychical stresses begin as soon as the limits of physiogenic capacity and the different outer appearance in comparison with the children of

the same age are stated consciously. This happens in the age of four or five years. That is why the prosthetic fitting ought to be carried out before this age. As it is impossible to compensate the function of the human arm and hand completely by technical appliances, we must do as much as possible for the completeness of the human figure. In this respect results are much better. The adaptation to the prosthesis must be carried out within the family and had to be completed before the child begins to visit the kindergarten. There a group of children without any respect will present the environment. We stated that contacts with the other children and the position within the group is not disturbed, if the child feels his arm-prosthesis as a part of itself before uniting the group and if its outer appearance is inconspicuous. For example, the hooks do not realize this predestination. Their favourable functional value is not utilized. Children, who are not fitted before beginning the kindergarten, can get an artificial limb in this time. After beginning of school the first adaptation to any prosthesis is seldom successful. We fitted initially 12 patients of 6 to 12 years of age. Five of them were not using the prosthesis, five - occasionally and only two - constantly.

We investigated in our follow-up several aspects, convinced of their cross mutual communication: motoric, mental, psychical and social development. Influence on one of these aspects has consequences upon the others, with exception of physiogenic development. The functional value of prosthesis with active joint movement - including myoelectric controlled prosthesis - is too small for the majority of our children. However, in spite of rejection of such a prosthesis, the general motoric development of the children with deficient upper extremities is not disturbed. Simple, durable prostheses with a good appearance, compared to it, have a favourable influence on psychical development and therefore on mental and social development as well. When the childhood is over, especially in juvenile amputees, all kinds of arm prostheses are to be taken in consideration and individually chosen.

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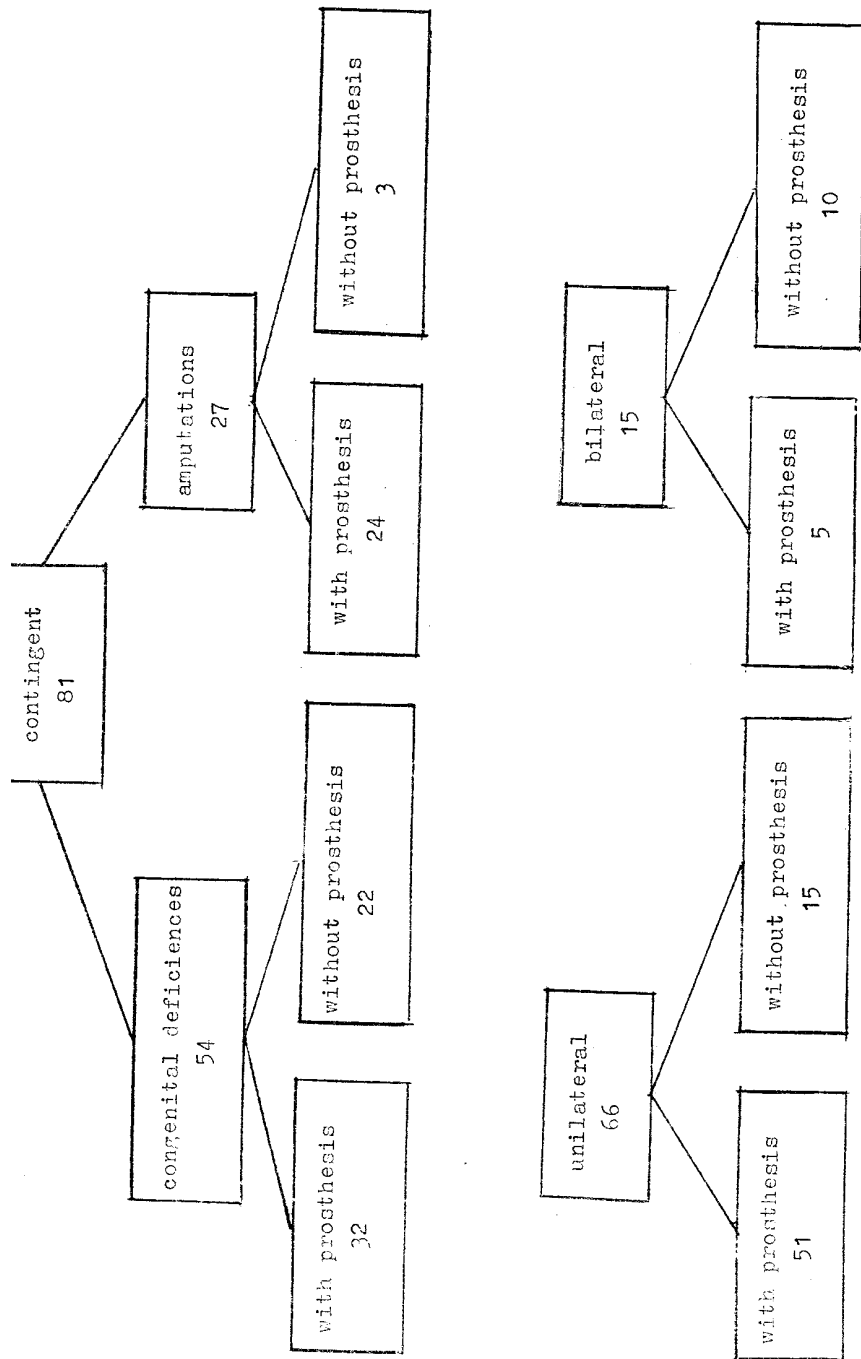


Fig. 1