

The Use of the SACH Foot with Children¹

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In August 1958 the Child Prosthetic Studies of New York University was asked to investigate the applicability of SACH feet to juvenile amputees. Accordingly a study was planned for implementation through twelve specialized child amputee clinics cooperating with the Sub-Committee on Children's Prosthetic Problems. The clinics were located in the following states: Alabama, California, Connecticut, Florida, Georgia, Illinois, Maryland, Michigan, New York, North Carolina and Washington. However, it quickly became apparent that a study comparing this foot with others in common use could not be readily conducted because most of the children in the participating clinics had already been fitted with the SACH foot. Hence, few individuals were available to be transferred from other types of feet to the SACH. In view of this fact, the comparative aspects of the study were abandoned. However, in the past two years so-called "normative" data have been obtained on more than 500 juvenile amputees, including 164 children with lower extremity amputations. These data include information on medical, fitting, checkout and training aspects of the prosthetic treatment program. This report represents experiences and reactions of 129 of these children who were fitted with SACH feet.

It is evident from these data (see Table 1) that SACH feet are being used extensively through the entire age range of the juvenile amputee population. They appear applicable to all types of lower extremity fittings, both unilateral and bilateral.

Of the 158 prostheses with SACH feet fitted to 129 children (including 29 bilaterals), 84 were new prostheses (not more than three months of wear) at the time that data were obtained. The other 74 had been worn for longer periods.

One hundred and forty-three of the 158 SACH feet examined at the clinics participating in the study were reported as being satisfactory in all respects. The defects noted in the remaining 14 feet (see Table 2) did not indicate any major problems in application, function, or durability. Four "new" feet were improperly sized or shaped, and one was not color matched to the shank—both problems readily correctable by the prosthetist. Deficiencies reported in the older feet, i.e., those that had been worn for more than three months, were again primarily matters of shoe fit (6 cases). In these instances, growth of the normal foot and increased shoe size was doubtless the significant contributing factor. In fact, the major consideration emerging from these data was that the SACH foot must be replaced with

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TABLE I
FOOT PRESCRIPTION BY AGE AND AMPUTATION TYPE
N = 164

AGE	Unilateral A/K		Bilateral A/K		Unilateral B/K		Bilateral B/K		A/K - B/K		Unilateral H/D		Bilateral H/D	
	SACH Foot	Other*	SACH Foot	Other*	SACH Foot	Other*	SACH Foot	Other*	SACH Foot	Other*	SACH Foot	Other*	SACH Foot	Other*
1	1				4				1		1			
2	3	1	1		9	1			2					
3	3	2				1								
4	2	1			4	1	3		1			1	1	
5	3		2	2	5				1					
6	5	1			7	3	1		1				1	
7	3				4									
8	3		2		3		2							
9		1		1	3	2	1		2			1		
10	4	1	1		7	2							1	
11	4				3			2						
12	3				6	1	2		1					
13	1	2	1		1	1	1			1	1	2		
14	2				3	2				1				
Totals	37	9	7	3	61	14	10	2	9	2	2	4	3	0

*The majority (22 of 34) of the feet other than SACH fitted to the sample were of wood with a two-way ankle. The remaining 12 were of miscellaneous types.

a larger size foot when the patient's shoe becomes excessively large for the foot. Otherwise, the SACH foot bends at the end of the keel and tends to break. Heel wedge wear was reported in two cases (after 16 and 17 months of wear, respectively) and heel delamination in one case (after 30 months of wear).

TABLE 2
SACH FOOT PROBLEMS
N = 14

Case	Length of Wear	Problem	Age of Patient
A	New	Did not fit shoe	2 years
B	New	Did not fit shoe	14½ years
C	New	Did not fit shoe	5½ years
D	New	Did not fit shoe	5 years
E	New	Color of foot does not match shank	14 years
F	21 months	Did not fit shoe	12 years
G	9 months	Did not fit shoe	3½ years
H	22 months	Did not fit shoe	12½ years
I	24 months	Did not fit shoe	6½ years
J	22 months	Toe turned up	8 years
K	6 months	Toe turned up	2 years
L	16 months	Heel wedge wear	14 years
M	17 months	Heel wedge wear	13 years
N	30 months	Heel delaminated	12 years

Gait evaluation data on the children in the study revealed a number of gait deviations which *might* be related to inadequacies in the foot, such as heel wedges which were too hard or too soft, improper keel length or faulty alignment of the foot (Table 3). However, in none of these instances

GAIT DEVIATION AND DEGREE OF DEVIATION

Gait Deviation	Slight	Moderate	Extreme	Possible Causes
Foot Rotation at Heel Contact	14	13	2	Excessively Hard Heel Wedge
Foot Slap	2	1	0	Too Soft a Heel Wedge
Uneven Heel-Toe Transition	7	8	2	Too Long a Keel Faulty Leg or Foot Alignment

was the gait defect specifically related to the SACH foot by clinic personnel who did the examinations.

Summary

1. On the basis of 504 juvenile cases surveyed (up to and including age 15), lower extremity amputees constitute approximately 33 percent of the total child amputee population.

2. Of 164 lower extremity cases, 129 or 78 percent were fitted with the SACH foot. Our data reveals that most clinics prescribe the SACH foot as standard procedure.

3. Of 158 SACH feet examined after periods of wear ranging from one to 30 months, only a small minority (approximately 10%) were regarded as unsatisfactory.

4. SACH foot fittings for child amputees do not appear to pose any special gait or fitting problems. However, replacement of the SACH foot to match changes in shoe size is desirable to avoid bending and possible breakage at the end of the keel.

Conclusion

On the basis of the available evidence, it appears that the SACH foot constitutes a satisfactory fitting technique for juvenile amputees.

New Members of CPRD Named

The Committee on Prosthetics Research and Development of the National Research Council has named four new members who will serve for three years each. The new members are:

Edward W. Snygg, President of the R. E. Huck Company of San Francisco. Mr. Snygg is Chairman of AOPA's Committee on Education and a former member of the American Board for Certification.

Robert L. Bennett, M.D., Medical Director, Georgia Warm Springs Foundation, Warm Springs, Georgia.

Maurice J. Fletcher, Col. MSC, USA, Director, Army Prosthetics Research Laboratory, Walter Reed Army Medical Center, Washington, D. C.

James B. Reswick, Sc.D., Director, Engineering Design Center, and Professor of Mechanical Engineering, Case Institute of Technology, University Circle, Cleveland, Ohio.

Chairman of the Committee on Prosthetics Research and Development is Howard D. Eberhart, Professor of Civil Engineering at the University of California at Berkeley; and Vice Chairman is C. Leslie Mitchell, M.D., Surgeon-in-Charge, Division of Orthopaedic Surgery, Henry Ford Hospital, Detroit, Michigan.