

SETHI AND HIS 'JAIPUR FOOT'

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Beginning from the third quarter of the 20th Century medical profession and medical services have become commercialized. Words like medical tourism, super speciality hospitals are becoming current. Such facilities are beyond the reach of common man especially from the poorer sections. In such a situation Dr R K Sethi not merely championed the cause of the common man but his inventions viz. the *Jaipur Foot* for the amputees and his calipers for the polio affected children were made available for the weaker sections at prices affordable by them. Not only that. His appliances were far superior to and more versatile than those available in the market for the well to do people at 10 to 50 times the price!

With an FRCS from Edinburgh, young Dr Sethi joined Sawai Man Singh (SMS) Government Hospital and Medical College in Jaipur as a Lecturer. In 1958 the hospital instituted an Orthopaedic Department and Dr Sethi was made its head.

There were no rehabilitative services at S M S. When Dr Sethi began his work he recognized the immediate need for physiotherapy. But the hospital had no apparatus and no money to provide it. There was a tradition by which grateful patients present gifts to doctors. Dr Sethi ruled that doctors in his department could not accept money, insisting that only a gift of something useful to the hospital should be accepted. When patients tried to press money on him, SETHI asked for equipment for his new physiotherapy section. As there were no sources of ready-made equipment he requested and was given raw material components like wood and pipes. One patient donated the wages of a carpenter and SETHI himself set out to find craftsmen who could build parallel bars and similar paraphernalia.

Dr Sethi also focused on changing the character of the occupational therapy practised at that time, which emphasized training patients in simple vocational skills such as weaving and knitting. He wanted to set up a workshop in which patients could use materials designed to improve motor and coordination skills while doing meaningful work. No space was available in the hospital, but the opportunity to establish a work area arose when the lease expired on a small tea shop on the hospital grounds. Overnight SETHI set up his workshop in the teahouse and moved in his staff.

Dr Sethi was determined to use occupational therapy as a means of increasing a patient's dexterity through participation in an engrossing activity. This led him to use nonconventional techniques and equipment. Pedal-operated saws gave patients the opportunity to exercise their legs while creating a decorative object. Dice and card games were used to encourage hand and mind coordination for stroke patients, and activities were designed to increase hand and finger dexterity for the partially paralyzed. As with the physiotherapy section the organization of this section was a response to the recognition of specific needs, using the small staff and simple facilities available.

During this formative period as head of the Orthopedic Department of Sawai Man Singh Hospital, SETHI became increasingly concerned with the problems of providing appropriate and inexpensive appliances for polio patients and amputees. The nearest sources of rehabilitative devices were over a thousand miles away (in Bombay and Poona); only his wealthier patients could afford the trip to obtain them. Dr Sethi began to look for a way to set up a workshop to create at least some of these appliances at the hospital.

Dr Sethi noticed a male nurse, Mohammad Khan, who, while working in a room where plaster casts were made, showed an active interest in mechanical and technical matters. Khan came from a family of craftsmen; to test his skills SETHI asked him to make splints and other simple aids. Recognizing Khan's potential, SETHI seized an opportunity to send him to the Bombay All-India Institute of Physical Medicine and Rehabilitation Workshop for a two-year training programme in the construction of appliances for the handicapped. In six months Khan returned, having learned everything the institute could teach him. SETHI thereupon set up a workshop for him in the old tea shop to which an affluent patient had added two extra rooms, making it possible for both Khan's shop and the occupational therapy workshop to be housed under one roof.

Khan's workshop became known as the Fabrication Unit and its first products were calipers (braces) for polio victims. Polio in India is a disease widespread among children; most Indians are exposed to it early in life and by the time they are adults, have either contracted it or become immune. Surgical intervention can straighten some of the deformities caused by polio, but a child needs a caliper to support a paralyzed limb to enable him to walk again. Calipers are fairly simple devices to make and the Fabrication Unit became proficient in their production.

Dr Sethi's growing confidence in the unit's capabilities led him to consider the production of artificial limbs. The simplest limbs to reproduce were those for amputees whose legs had been taken off below the knee, so in 1965 the Fabrication Unit started making limbs based on Western models using the "Solid Ankle Cushioned Heel" (SACH) foot piece.

The SACH foot was designed to be worn with a shoe which disguised its artificiality and protected it. Its rockered sole provided ease for walking, but its rigid wooden keel-from ankle to instep-made it difficult for the wearer to walk over rough ground and impossible to squat or sit cross-legged. It was, however, a great improvement over the peg leg which medical wisdom had decreed was the prosthesis to be provided to the poor. "While it is true that a peg leg is simple and inexpensive," SETHI has written, "even the rural amputee of today would reject it on cosmetic grounds." Its appearance is a constant reminder of the maiming of the wearer. It was the SACH foot, then, that the workshop made and which was fitted to SETHI'S patients.

During the first two years that these limbs were being made SETHI became aware that the limbs were often discarded after their novelty wore off. Investigation proved that the limbs had been constructed and fitted properly, but that the wearers found them inappropriate to their needs. The shoe presented most of the problems. It was superfluous for Indians who customarily went barefoot in the fields, at home, at work and at places of worship. It was expensive

and deteriorated rapidly when exposed to water or mud. In addition it severely limited postural flexibility.

Recognizing the defects of the prosthesis SETHI drew up criteria for an ideal footpiece. He described his needs to the workmen in Khan's shop. The foot should not require a shoe, therefore, it must look like a bare foot. It should be waterproof and durable. It should be flexible enough to allow for ease of walking over uneven ground and for its wearer to squat and sit cross-legged. Finally, it should be made of inexpensive, readily available materials.

After a number of trials, using different materials in different combination, the appearance of the foot was improved when an amputee's brother provided colored rubber from his factory and the foot could then be made in a choice of three shades-light, medium or dark brown—to correspond with the wearer's skin color. The first feet produced were all the same size but later different dices were made. The solid unseparated rubber toes, which had a discouraging habit of getting knocked off during hard wear, were improved by hollowing them out and packing them with light sponge rubber. A slit could be made between the great and second toes to permit the amputee to wear a sandal.

Making of a prosthesis (artificial limb) is generally taken to be a high technology. The product is high priced and the poor and lower middle class patients cannot afford it. By producing the *Jaipur Foot* in an improvised workshop in front of the patients, Dr Sethi broke the myth of high-tech about the prosthesis. The product was not only affordable but was also versatile and superior to high-tech products then available in the market.

Till *Jaipur Foot* was introduced in 1970, only western model of limb was available. This needed a western way of life-sitting on a chair-using a western model toilet etc. which hardly anybody in rural India or lower middle classes had. The new design developed by Dr Sethi takes into account not only the functional demands of floor sitting, barefoot walking culture of the majority of Indian population but it also added new dimensions a much more flexible foot piece, with more freedom of movements than is currently available in any prosthetic foot anywhere in the world. The fact that it has a cosmetic appeal of resembling a natural foot and its resistant to water as well as the rugged terrain of the countryside, is an additional bonus.

Dr Sethi passed away on the 6th January 2008. He was really an extra-ordinary person. His knowledge and skills extended beyond medicine to engineering and carpentry, books on different subjects, plants and animals etc. etc. The Nation has really lost the role model of a great pioneer doctor with a human face and enormous compassion. □□□