Jaipur Foot / Limb Project

Addressed by: D. R. Mehta

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1. I am extremely grateful to the Executive Committee of - Design for Changing the World, Nappon Foundation, CANPAN Project for inviting me here in this august conference to share my views about a world renowned humanitarian venture called the JAIPUR FOOT / Limb project. I am equally grateful to Mr. Takuto Motomura who, on your behalf, persuaded me to come here. Mr. Motomura took the special trouble of visiting our Jaipur Foot / Limb center in Jaipur a few months ago. He saw the process very closely and also met the patients. During his visit he could sense the life transforming impact of this prosthesis.
2. Let me also say that Japan is a great country. We in India admire it. In the past I had visited Japan several times. My last visit was in Oct. 2009 when, as part of the delegation of the Government of India, I had the opportunity of visiting several institutions providing help to the disabled of various types in your country. I was highly impressed by the substantial financial and other support provided by the Government of Japan to large number of socially oriented schemes, benefitting huge number of the disadvantaged people here.
3. Jaipur Foot / Limb Project have four dimensions, technical, social and ethical, managerial and financial. While the limb was developed in 1968, till 1975, i.e. in first seven years hardly 50 limbs could be fitted. This was because of the emphasis on the single technical aspect. In 1975 Bhagwan Mahaveer Viklang

Sahayata Samiti (BMVSS) was set up as a non-governmental organization. It was my privilege to do so. The BMVSS integrated these technical, social cum ethical managerial and financial elements. The result was that Jaipur Foot / Limb spread all over India and the world. Time Magazine in the fall of 1997 wrote this "**People who live inside the World's many war zones from Afghanistan to Rwanda may never have heard of New York or Paris but they are likely to know that a town in northern India called Jaipur. Jaipur is famous in strifetron areas as the birthplace of an extraordinary prosthesis or artificial limb, known as the Jaipur Foot, that has revolutionized life for millions of land mine amputees. The beauty of the Jaipur Foot is its lightness and mobility – those who wear it can run, climb trees and pedal bicycles – and its low price".**

4. Let me first mention the special or salient technical features of Jaipur Foot / Limb project. The prosthesis has two parts in case of below knee amputees. These are foot piece and shanks (including socket). The prosthesis for an above knee amputee has three parts namely foot piece, shanks and sockets and a knee joint in between. I would like to touch on all of these.

4.1 Invented in 1968, in the well-known S.M.S. Medical College Jaipur in India, Jaipur Foot / Limb is a very simple yet highly effective and patient friendly prosthesis.

4.2 In technical terms, as compared to most of the foot pieces developed in the western world, Jaipur Foot is closest to the human foot in terms of functions and appearance. It is a multi axial foot which has most of the movements available in a normal human foot. It has dorsi-flexion or movement at the ankle level, which the SACH Foot, mostly fitted in the western world, does not have. Jaipur Foot has supination and pronation movements at the sub-talar level. It also has axial rotation. These latter movements too are not available in the SACH Foot.

4.3 Three experts of the Department of Orthopaedics and Accident Surgery, Royal Liverpool University Hospital – U.K. studied in Jaipur Foot and

published a paper called "**A Biomechanical comparison of the SACH, Seattle and Jaipur Feet using ground reaction forces**". Their conclusions were as under –

4.3.1 The Ground reaction force data has been successfully used to quantity shock absorption characteristics of prostheses and their effect on locomotor style.

4.3.2 The SACH Foot has a better shock absorption capacity than the Seattle and Jaipur Feet.

4.3.3 The performance of the Jaipur Foot is more natural and nearer to the normal foot as compared to the SACH and Seattle Feet.

4.3.4 There are no other significant differences in gait style produced by the SACH, Seattle or Jaipur Feet.

4.3.5 Heal of the SACH foot is softer and therefore shock absorption is slightly better, but this is not a very significant advantage. Indeed below knee amputee with Jaipur Foot and Limb can climb a tree and also jump from it, showing that the absorption characteristic in Jaipur Foot is sufficient to meet the human requirements.

4.3.6 Jaipur Limb initially was using aluminium as a material for making shank. This was given up about 15 years ago and now shanks are being made of high -density polyethylene, a bio-compatible material used even in the western world. Even the process of making this is similar to that followed in the western world. For last decade all sockets are of total contact socket, made through vacuum forming machines, as in the west. Thus in the socket or shank making there is no difference between Jaipur Limb and the western limb. However, in case of Jaipur Limb there is one additional positive feature. In the western world while making a shank, a heated plastic sheet is wrapped over the positive mould made of plaster of Paris, in case of Jaipur Limb, a plastic pipe is used. The advantage of Jaipur system is that the shanks has no seam and thus is stronger and cosmetically better.

4.3.7 As mentioned earlier, with Jaipur Foot and limb, a below knee amputee can walk without stick like any normal human being. He can run. Many of the

below knee amputees with Jaipur Foot and limb can cover a kilometre in 4 minutes and 30 seconds. One of the amputees with Jaipur Foot and Limb has run half Marathon in Mumbai – India and covered a distance of 21 kilometres. Such amputees with Jaipur Foot / Limb can negotiate undulated ground very comfortably. Further, as mention above a below knee patients climb a tree and from jump from it. He can ride a bike and drive a motor car. In short both functionally as also cosmetically they are like normal beings. Such patients come to our centers truncated but go out as whole again.

4.3.8 For above knee amputees knee joint is a problem all over the world. The knee joints either have the flexibility or the stability. They do not have these basic requirements as in the case of a normal limb and knee joint. In the west some electronic joints have been developed. But these are extremely costly and not affordable by large number of amputees. In this background, the world famous Stanford University – USA, working with the team of BMVSS, Jaipur, developed a new four bar linkage polycentric Knee Joint for above knee amputees. This is called Jaipur-Knee Joint. The world famous TIME Magazine (issue of 23rd Nov 2009) hailed this Jaipur Knee as one of the Best – 50 Inventions of the world in the year 2009. The Time Magazine is quoted is as follows

The US$20 Knee – “Tens of thousands of amputees in the developing world wear an inexpensive prosthetic called the Jaipur Foot. But poor patients who lose a knee joint have few options: a titanium replacement can cost US$ 10,000, and crude models don’t work very well. Now a team of Stanford engineering students has designed a knee that’s not only dirt cheap – just $ 20 – but also mimics the natural joint’s movements. Developed with the Jaipur group, the Jaipur-knee is made of self-lubricating, oil-filled nylon and is both flexible and stable, even on irregular terrain. The device is being tested in India: more than 300 people have been fitted so far”

This number of 300 is an old one. By now, almost 1500 artificial limbs with Jaipur-Knee joint have been fitted to the above knee amputees. The feedback received from the patients is highly positive.

4.3.9 The time taken to make a below knee limb is just one to two days. The time taken to make an above knee limb is two to three days. Generally, according to our information, there is hardly a limb fitting organization in the world which provides these limbs before three months.

4.3.10 It is the basic philosophy of BMVSS that there should be a continued the inventive effort. BMVSS has a very strong Research & Development Wing. Further, for this BMVSS has also entered into agreements or have associated the world famous technology institutions. As already mentioned above, BMVSS has a memorandum of understanding with the renowned Stanford University – USA. In August 2010 a team of another great technology university of the USA namely MIT is visiting the center BMVSS at Jaipur for a month to consider setting up a FabLab for Orthopaedic Device s. This would be the first lab of its kind of the world. BMVSS also has a memorandum of understanding with the Indian Space Research Organization (ISRO), a world renowned scientific body which makes satellites and rockets for India. They have given a new design for making Polyurethane Foot (PU) called Mahaveer-ISRO Foot. There were some problems and now the world's largest chemical and polymer company DOW Chemicals – USA its providing us the technical support. The PU Feet are under field trials and if successful, these foot pieces made through computer controlled injection moulding process will further revolutionize the Foot technology in the world. In addition the Professors of the Indian Institute of Technology are on our Technical Committee.

4.3.11 MVSS also have a training Institute.

5 On the socio ethical side, BMVSS has adopted patient oriented value system. It is not doctor-centric or hospital-centric, but patient-centric. Patient is the focal point. Apart from providing the amputees mobility, BMVSS also give them dignity. 95% of our patients are below the poverty line. But they are our

brothers and sisters and deserve respect. It is our moral duty to help them. They are all given artificial limbs totally free of charge. If BMVSS had not followed this policy, such poor people would never have got the limbs and the mobility. Our average cost of an artificial limb is US$ 40 in Jaipur. In camps that we hold outside the country the cost goes up, say maximum to US$ 250. Against this the average cost of an ordinary limb with SACH Foot in the USA is about US$ 10,000. But the patients are given the impression that this is a help and not charity to them. This approach along with the technical excellence of the limb, is highly appreciated by the patients and they reach us in large numbers. By now we have received over 1.15 million patients who have been provided with artificial limbs to amputees (3.75,000), Calipers to polio patients (3,00,000) and other aids and appliances like wheelchairs, hand-paddled tricycles, crutches etc (3,40,000). The only other place where so many poor people get help is Mother Teresa's Home, though their assistance is of a different type. Mother Teresa visited our center when she was alive and blessed us. All the cases of her home needing callipers are sent to our center.

5.2 BMVSS has also evolved a new system of affordable health care management system of health care. The subject of health care is being discussed in the USA and other countries of the world with the focus on affordability. With our system even the most poor person gets his due care.

6 Another aspect is the managerial one. The formal structure of the hospitals and prosthetic center is highly rigid and dilatory. An amputee to get a limb has to first write to the institution to get the appointment. After getting the reply he goes to the institution. After reaching there, he is first registered. Thereafter he is admitted. Then an assessment is made and measurement for making the limb is taken. Thereafter he is called the second time after three or four months. He comes back gets a limb. The total time and cost involved are substantial. BMVSS follows a different system. We have broken this formal system. The policy of BMVSS is do have an open door policy. A patient can come to our

center without any prior appointment at any time of day or night. He is immediately admitted. He along with his attendant or family is given free board and lodge. In next one to three days he gets the limbs. He is not called back. Till he gets his limb, he stays at our center at our cost. He is paid the Railway fare to reach home. Persons like Prof. C. K. Prahlad of Michigon University studied this system and commended it.

7 Yet, other element is that of finance. Even though our costs are so low, since we get about 65,000 patients at our 20 centers in india in a year, the total yearly expenditure is around US$2.5 million. About 1/3 of this amount comes from the Government of India as grant. About 10% of this expenditure is met by our own income on the corpus built up over time. The rest of the amount has to be collected through donations, small or big, from India or abroad. It is always a tedious task. However, our efforts do yield results. We appeal to the individuals and corporate bodies of Japan, committed to corporate social responsibility to help us financially. By doing so they will be helping the poorest of the poor get limbs and walk again. It would be an act of humanism.

8.1 I would also like to mention about the work of BMVSS in the foreign countries. By now BMVSS has held on-t he-spot limb-fitment camps in 23 counties of Asia, Africa and Latin America, including countries like Pakistan, Afghanistan, Vietnam, Sudan, Rwanda, Kenya, Honduras etc. In the months of March-April 2010, BMVSS held a camp in Baghdad – Iraq fitting 882 limbs, despite the deathly dangerous conditions prevailing there. Another camp was held by BMVSS in Tamil Area of Sri Lanka also in the months of March-April 2010 fitting about 1200 limbs and callipers. In some of the countries India is known for Jaipur Foot.

8.2 BMVSS also has been Special Consultative Status with the Economic & Social Council of the United Nations Organization – New York.

9 I would also like to share my experience of being part of BMVSS. I met with a severe accident involving the breaking of my thigh bone and remained in hospital

for five months and did physiotherapy for another year and half. This brought me in direct touch with the amputees I was made aware of their miserable plight. This trauma made me set up this organization. Many friends and colleague joined it and today it has the distinction of being the largest organization for the disabled in the world. It single handedly does more than twice the work of the International Committee of the Red Cross under its Special Fund for the Disabled, which is being operated in 26 countries through 59 organizations. Indeed while we fit about 20,000 limbs a year, perhaps no organization in the world fits even 1,000 limbs a year.

In short, BMVSS is a purely humanitarian organization committed to the cause of the handicapped. It provides largest number of amputees with limbs and other aids and appliances. It also strives for excellence and has the tie up with best known scientific institution and scientist. But, its hallmark is the service.

Thank you,

(D. R. Mehta)