

Indian military scientists beat swords into plowshares

A composite material previously used to make critical parts for India's military missiles is now being applied to peaceful ends, bringing the possibility of walking again to the estimated eight million Indians crippled by polio over the last 25 years. Defense scientists in Hyderabad are using the material to construct lightweight leg braces (calipers) that will be easier to obtain, less expensive, and more comfortable than the leather-wood-and-steel (LWS) caliper currently in use.

It is estimated that 90 percent of the polio victims in India now live without a walking aid, largely because there are not many places in the country where they can get one. And, with polio continuing to occur, the backlog of cases requiring calipers continues to increase. Furthermore, the LWS caliper has significant drawbacks even for those lucky enough to have access to one: It is cumbersome to put on and remove, it is costly (each one has to be specially made for the individual patient), and it weighs up to three kilograms (approximately six-and-a-half pounds) — so heavy that small children using it literally have to drag their feet.

The new walking aid from the defense institute scientists will, they hope, change the situation. Physicians at the Nizam Institute of Medical Sciences in Hyderabad have fitted this device to 262 polio victims, with "excellent results," according to Narendra Nath, the Nizam Institute's chief orthopedic surgeon.

The new caliper is made of fiberglass-filled polypropylene, and weighs "only 200 to 300 grams, and has no nuts or bolts" says Shankar Rao, deputy general manager of the Composite Products Centre (COMPROC), the supplier of the material. The apparatus consists of three parts: a cap that fits over the knee, a foot plate (against which the foot rests), and two 2-inch wide strips that connect the cap and the foot plate, forming a single integrated assembly. "With some practice" says Nath, "the victim can walk almost with normal gait, squat on the floor and go to sleep [wearing] it." None of these actions is possible with LWS calipers.

The device is also referred to by its technical name: floor reaction orthosis or FRO, because the heel of the foot plate striking the floor causes a reaction that forces the cap to tighten its grip on the knee, preventing it from buckling. Although the lightweight caliper is new,

the FRO concept itself is not. It was invented in Israel in 1969 and brought to India in 1983 by P.K. Sethi, a surgeon internationally known for his invention in 1983 of the rubberized "Jaipur" foot for amputees (most popular in Cambodia, where thousands of children lost their legs in land-mine explosions). COMPROC scientists improved upon Sethi's design by using computer software to model the calipers, and they streamlined the manufacturing method by using the composite material left over from their missile program. "We must have used a million [US] dollars worth of computer time on the design and standardizing the sizes of the three parts of FRO," says Mayak Dwivedi, a COMPROC engineer.

The scientists found, after taking the leg measurements of several hundred polio victims, that manufacturing only seven different sizes will probably be sufficient to cater to the needs of all the polio patients in India. This means that it will no longer be necessary for a polio victim to have a caliper custom-built, one of the main reasons for the severe shortage. Instead, the three basic parts of the FRO can be mass-produced in factories and made available in all sizes throughout the country. "Getting an FRO will become as easy as picking up

shoes in footwear shop," says Dwivedi. "Once a patient comes in, the right size parts can be taken off the shelf and assembled using nothing more than a heat gun." According to Nath, the patient can get the walking aid within hours, or at the most a day if "fine tuning" is required. Finally, such mass production will reduce the price of the caliper to approximately ten US dollars, one-fourth the cost of the current LWS caliper.

The FRO program has now been converted into a government mission with help from the Department of Science and Technology and the Ministry of Welfare. COMPROC plans to produce 5000 samples in March and ship them to different places in India for a final evaluation before full-scale manufacture of FROs, in a joint venture with an as-yet-undetermined private company in India. However, A.P.J. Abdul Kalam, India's chief defense scientist and the driving force behind the FRO project, believes that within two years all polio-stricken children could be equipped with lightweight FRO, permitting them a degree of mobility they would otherwise never have.

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A prescription for Australia

The intervention of the Australian government to protect and strengthen the country's fledgling pharmaceutical industry has helped bring it back from the near-extinction it faced in the mid-1980s, but the government can do better than its current plan. At least, that is the conclusion of a report from a government advisory body on industrial affairs, released late last year. The report, entitled *The Pharmaceutical Industry*, paints an optimistic picture of the industry's current state, but admits that the government will have to continue to support the industry past 1999, when the current program of government support will end.

Ironically, the industry's problems in the 1980s were largely due to the Australian government. The system of price controls and subsidies known as the Pharmaceutical Benefits Scheme, imposed in the 1950s to ensure all Australian citizens access to low

cost medicine, began to unravel when the gap between prices allowed in Australia and prices paid overseas for the same drugs widened substantially, leading to the pull-out of many multinational pharmaceutical manufacturers and increasing difficulties for pharmaceutical importers.

The current government fix, known as the "Factor *f* scheme," was established in 1987 to revive the pharmaceutical industry in Australia. It provided, among other things, substantial reimbursement of R&D costs as well as payments to make up the difference between Australian and overseas prices for commonly prescribed drugs. The advisory body's report says that the Factor *f* scheme, although preventing the demise of the industry, needs to be scrapped in favor of some other approach after it expires in 1999.

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