The New England Journal of Medicine -- November 23, 2000 -- Vol. 343, No. 21
EDITORIAL

Hip Protectors -- A Breakthrough in Fracture Prevention

Hip fractures are one of the most devastating and costly problems commonly faced by elderly people. Each year in the United States, more than 300,000 people 65 years old or older are hospitalized because of hip fractures, (1) and about a quarter of these people survive for less than one year because of the fracture or its complications. (2) Of those who survive, most have substantial reductions in their ability to function in daily life and in their ability to walk, and a sizable minority are living in long-term care institutions by the end of the year after injury. (2)

Most previous attempts to prevent hip fractures have focused on reducing underlying causes and risk. Hip fractures usually result from two interacting processes: a fall or other traumatic event resulting in direct impact to the greater trochanter and an underlying weakness in the bone caused by osteoporosis. Each of these processes has underlying risk factors that have been reasonably well studied. The leading risk factors for falls in older adults include weakness, gait and balance disorders, functional impairment, visual impairment, cognitive impairment, and the side effects of drugs, together with the presence of hazards in the environment, such as icy pavements or objects on the floor. Multifactorial assessments of risk, combined with targeted interventions such as exercise programs and inspection and control of hazards in the living environment, can significantly reduce the incidence of falls, by 10 to 30 percent, but these measures do not prevent the majority of falls. (3,4,5,6) The second key process underlying hip fractures, osteoporosis, can be treated with a variety of medications, such as estrogen, calcium, vitamin D, and bisphosphonates. However, these interventions also provide only partial protection. Clearly, reducing the risk of falls and the risk of osteoporosis is only part of the solution to the problem of hip fractures; other approaches are needed.

In 1993, Lauritzen et al. reported the results of a clinical trial that tested just such a different approach. (7) In 10 Danish nursing homes randomly assigned either to provide all their ambulatory residents with impact-absorbing hip protectors for routine use or to give all their ambulatory residents usual care, the rate of hip fracture after 11 months of follow-up was 53 percent lower in the hip-protector group. Even more impressive was that none of the subjects who did have a hip fracture were actually wearing hip protectors at the time of fracture -- a finding that both magnified the potential size of the effect of this intervention and pointed to an important limitation, which is the difficulty in convincing people to wear the protectors consistently.

These results were received with great excitement, and there was clamor to see them reproduced. However, the results were also met with some skepticism because of the large effect as well as the open design inherent to this kind of study, in which both the subjects and the investigators are aware of the study assignments. Furthermore, the base-line rate of hip fracture in these Danish nursing homes was high -- many times higher than in the United States -- perhaps because of a greater prevalence of osteoporosis in Scandinavia. Nonetheless, the study was widely cited, and companies worldwide began manufacturing and marketing hip-protector devices. It soon became apparent that most elderly people were not yet sufficiently concerned or motivated to endure the inconvenience of wearing hip protectors. Relatively few are currently in use, although some nursing homes have begun using hip protectors as part of programs aimed at preventing falls and injuries. Confirmatory data have been urgently needed. The results of a small Swedish study appeared to confirm the findings of the Danish study, (8) but until now, no large-scale studies have been published.

In this issue of the Journal, Kannus and colleagues report the results of a large-scale study in Finland. (9) Their trial involved subjects 70 years old or older who had one or more risk factors for hip fracture (e.g., a previous fall or fracture, impairment of balance or mobility, use of aids in walking, cognitive impairment, or use of drugs that predispose people to falls or fractures) and who were being cared for at any of 22 community-based health care centers. About two thirds of the subjects were residents of the centers, and about one third lived in their own homes, supported by a center's home-care program.

A sizable proportion of the subjects in both the hip-protector group and the control group refused to participate, an additional one third in each group dropped out of the study, and the rate of noncompliance was high in the hip-protector group. Nonetheless, the rate of hip fracture in the hip-protector group was 54 percent lower than that in the control group. In an attempt to account for the effects of compliance or noncompliance, the authors also calculated the rate of fractures among subjects in the hip-protector group according to whether they were wearing or not wearing hip protectors when they fell. They found that the rate of hip fracture per fall was 84 percent lower when the hip protectors were being worn. The latter calculation is only an estimate, because this subgroup analysis was not randomized and because many other variables may have differed between those wearing and those not wearing the protectors. Nonetheless, this study provides strong and timely confirmation of the efficacy of hip protectors in subjects at high risk for hip fractures. Although calculations of cost effectiveness were not performed, the cost of a hip protector must be small compared with the cost associated with a hip fracture, and according to the authors' calculations of the number needed to treat, only 41 persons need be offered a hip protector to prevent one hip fracture during the course of one year.

Every study has limitations. In this study, randomization was performed at the level of the health care center, rather than at the level of individual subjects; this approach, in addition to affecting statistical calculations, raises the possibility that the results were affected by other differences among the centers in health care practices, besides the use of the hip protectors. For obvious reasons, the intervention could not be given in a double-blind manner; however, the outcome of interest was sufficiently objective that most potential types of bias should not have been a problem. Dropouts and intercurrent deaths plagued this study, as they do almost every long-term study involving frail, elderly people. The authors compensated for this problem by using an intention-to-treat analysis, adding new subjects to replace those who dropped out, and annualizing the follow-up data. Finally, as reported previously, it has been notoriously difficult to convince people to wear these protectors, although with improving attention to comfort and with more solid data demonstrating efficacy, compliance should improve. In another recent study of hip protectors, in Australia, hip protectors improved the self-confidence of frail subjects and led to improved mobility and daily function -- effects that, if confirmed, could also lead to improved compliance. (10)

Despite its limitations, the message of the study by Kannus et al. is clear. Hip protectors offer a powerful new method for reducing the risk of hip fracture. Their use should be strongly encouraged for persons at increased risk (i.e., those with osteoporosis and a high risk of falling, such as those with impaired gait or balance and weakness) and particularly for those residing in health care institutions, because they are likely to be frail. Future research should focus on ways to improve the acceptability of hip protectors and on better defining the subgroups that can derive particular benefit from their use.

Laurence Rubenstein, M.D., M.P.H.
Greater Los Angeles Veterans Affairs Medical Center
Sepulveda, CA 91343