

Future Treatment and Research Directions in Distal Radius Fracture

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KEYWORDS

• Distal radius • Future • Fracture • Treatment • Economics

Dr Harold Horowitz, writing in the *Journal of the American Medical Association* in 1999, presented an apocryphal story of an intern's admission note, dated November 17, 2150. The patient being admitted is a 150-year-old woman with a urinary tract infection. Along with many chronic medical disorders, her surgical history is noteworthy and may be a small window into our future. She had a coronary artery bypass grafting 80 years prior with follow-up prophylactic gene therapy 40 years later; bilateral corneal transplants 75 years ago; a kidney-pancreas transplant 60 years ago; bilateral knee replacements 47 years ago; and a femoral head excision with regrowth by osteophyte-stimulating factor for osteoarthritis of her left hip 35 years prior. Unfortunately, despite all of these medical advances, the patient was confined to a nursing home for the past 55 years and was bedridden. The cost of this fictional 2-day hospitalization for the urinary tract infection was estimated to be 340,000 dollars.¹

Although apocryphal, this story presents several provocative issues that will have some relevance to the discussion of the possible future directions in the management of fractures of the distal end of the radius. This article attempts to project what we might encounter in the future with regard to epidemiology, risk and prevention, fracture assessment and treatment, and the ever increasing concern for the economic impact of this prevalent injury.

EPIDEMIOLOGY

Whether or not people will have their lives dramatically extended in the next few decades, it is clear

that people are living longer, healthier, and more active lives. The 2 peak incidences of distal radius fracture will remain within the pediatric and geriatric age groups, with the latter experiencing a substantial increase in the coming years.^{2,3} In a recent systematic review by Diaz-Garcia and colleagues,⁴ it was estimated using Medicare data that as many as 372,000 individuals 65 years and older will sustain a distal radius fracture during the next year. This high incidence rate will most likely increase as the Baby Boomer generation continues to age. We will also certainly witness an increase in the number of outcomes evaluations, not simply of functional and radiographic parameters but of quality of life and cost-analysis data.⁵

RISK FACTORS

Given the recognized prevalence and economic impact of fragility fractures such as those seen in the hip and distal radius, research into the mechanism as well as the treatment of osteoporosis will have increasing importance. In the immediate future, there will be greater emphasis on diagnosis followed by pharmacologic treatment, albeit currently unpredictable.⁶ Systematic reviews and meta-analyses will be found more and more in the literature, which is very likely to result in diagnosis and treatment algorithms that, it is hoped, are based on best evidence.⁷ Electronic medical records will automatically flag postmenopausal women and even men older than 50 years, creating pathways to obtain dual-energy x-ray absorptiometry (DXA) scans.⁸ Very likely this will also be evident when the diagnosis of a distal radius

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fracture is placed on the “problem list.” It remains to be seen whether tools such as the World Health Organization’s Fracture Risk Assessment (FRAX) tool will become standard practice or will simply be replaced by a more predictable method of objectively assessing the probability of a patient being at risk for a fragility fracture.⁹

Most of the pharmacologic agents currently available are antiresorptive, but the future holds promise for more active drugs and genetic analysis, leading to far earlier treatment and preventive measures. Of interest in Horowitz’s fictional intern’s admission note, his index patient had slow-cyclic release estrogen implants replaced annually. There is every reason to believe that in the future we will see the use of this type of prophylaxis that is used to enhance the metaphyseal regions of the hip or wrist, especially after a contralateral fracture.¹⁰ These and other advanced treatment protocols, such as injectable forms of growth factors and bone morphogenic proteins, are discussed in further detail in the following sections of this article.

Can the risk of a fracture from a fall from a standing height be better understood and even minimized? Studies have implicated postural instability or “sway” as an important risk factor for the development of a distal radius fracture.¹¹ Postural instability can be tested by the ability of a subject to maintain his or her balance on a tilt board with a progressive decrease in the ambient light. Crilly and colleagues¹¹ identified a subset of women with a fracture of the distal radius with diminished postural stability when compared with control patients matched for age, gender, and associated medical illnesses. It was suggested that medication interactions could be one of the contributing factors. If a device could be developed and maintained in the office of every primary care physician to test postural instability coupled with a DXA scan, it could become part of every annual physical examination for at-risk populations.

FRACTURE ASSESSMENT

The concept that function will follow form as an outcome of an osteoporotic associated distal radius fracture has long been an accepted tenet of treatment. Ng and McQueen¹² made a series of recommendations regarding radiologic articular congruity in a recent review of studies involving distal radius fractures. These investigators recommended that articular reconstruction be achieved with less than 2 mm of gap or step-off, that the radius be restored to within 2 mm of its normal length, and that carpal alignment be restored,

with the ultimate aim of treatment being a pain-free wrist joint without functional limitations.

Although there is historical evidence of functional recovery treated with limited fracture reduction and early functional use of the hand and arm both in the Chinese literature and through the work of Lucas-Champonniere,^{13,14} the need for a more perfect fracture alignment is once again being challenged. In a recent retrospective case-controlled study, Egol and colleagues¹⁵ compared surgical treatment with cast immobilization in elderly patients who suffered a distal radius fracture. The study revealed no significant difference in function or overall outcomes between the operative and nonoperative groups, despite poorer radiographic alignment in the nonoperative group. A prospective randomized study by Arora and colleagues¹⁶ comparing volar locking plates with cast treatment in elderly patients found a similar result. What does this mean for the near future? The American Academy of Orthopedic Surgery recently attempted to create a clinical practice guideline for the treatment of distal radius fractures, yet after extensive reviews of outcome studies and despite the experience of the investigative task force, nearly all the recommendations were thought to be inconclusive.¹⁷ It is clear that additional efforts, both within our specialties as well as those entities responsible for payment, will be ongoing in attempts to establish more precise guidelines leading to best-practice algorithms.

Shauer and colleagues¹⁸ evaluated current and future costs to Medicare in the United States, and estimated that based on current trends in the use of internal fixation, the cost will reach \$240 million within a few years for the treatment of distal radius fractures. This figure is largely attributable to the fact that the newer plate technology costs Medicare nearly 3 times more than the traditional treatment options. Thus the burden of proof will increasingly be on our specialties to use more clearly defined outcome tools and evidence-based level I studies if we wish to continue to use surgical treatment with costly implants.

TREATMENT

Years of experience using percutaneous pins or Kirschner wires with or without casts or external fixation have realized the problems with such methods, and have led to the development of the angular stable plate. Will the current enthusiasm for volar locking plates remain, or will it be yet another example of Scott’s parabola illustrating the rise and fall of a new surgical technique?¹⁹ A remarkable amount of energy and effort is being

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