Advances in Limb Lengthening and Reconstruction

Editorial Comment

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This Symposium represents both clinical and basic science work presented at recent Limb Lengthening and Reconstruction Society (LLRS) meetings. The Society, now entering its 20th year, was initially founded in 1989 as “The Association for Study and Application of the Methods of Ilizarov-North America” (ASAMI-NA) modeled after a similar group created in Italy several years earlier. Nearly a decade ago, our organization joined the Council of Musculoskeletal Societies (COMSS) of the American Academy of Orthopaedic Surgeons and changed its name to reflect a broadening interest in all matters related to limb elongation and reconstruction. The LLRS has members from all over the world. The Society promotes and funds basic science research into bone growth and healing.

The LLRS, and its contributions to the orthopaedic community, have evolved over the past two decades. Originally, the organization was formed to better understand the basis of circular, tensioned-wire external fixation and the concept of distraction osteogenesis. Since its inception, we have advanced to the point where we regularly contribute to the scientific understanding of distraction osteogenesis and bone formation, and just as importantly, to a leadership position in educating surgeons about the correct methods of external fixation application and use.

The concept of limb lengthening is at least a century old: Codivilla, in this month’s *Classic*, first described methods to do so. However, it has become apparent that the fixation

apparatus is not as important as the technique involved; this is why so many external and internal devices are being tried in clinical practice. The common goal of these advances is always the same: reduce the time in external fixation. As several articles in the symposium demonstrate, it is not just external fixation that is used and studied for limb lengthening and bone transport. Proper technique for lengthening over intramedullary nails is now widely accepted, and an article in this symposium goes a step further: Rozbruch and colleagues describe a method for safely externally lengthening and then secondarily nailing the tibia to reduce time in the fixator.

Basic science articles in this symposium elucidate the most stable patterns of pin placement utilizing multiplanar fixation. Another submission outlines the relationship of shear to compression for differing degrees of fracture obliquity. Fracture geometry concepts have progressed dramatically over the past decade. Recommendations for stable external fixation of fractures have evolved from anecdotal experience and armchair philosophizing to laboratory bench testing. This has reduced the number of poorly designed external fixators in the marketplace. It has also helped define better training protocols for external fixation systems.

Timing of fixator removal remains a major concern in clinical practice. The use of DEXA scans at distraction osteogenesis sites may help determine when bone is strong enough to allow for external fixator removal. Although this problem is not yet solved, it is clear that in the future, practical procedures will help the surgeon better define newly formed bone’s strength and stability.

Work is being done by members of the Society in various areas of fracture care and healing. Tsuchiya and colleagues report on the effect a recently described growth and differentiation hormone exerts on basic fracture healing. We

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have been using BMP-7 and BMP-2 for some time in clinical practice, and their indications of use are slowly being defined. Investigation into these new growth and differentiation factors will further our ability to promote and, more importantly, control fracture healing and distraction histiogenesis.

Although research on new bone growth factors is an important area of interest to the LLRS, bone grafting remains a mainstay in our clinical practices. Work on improved techniques of autogenous bone grafting, presented by Conway and colleagues, remains a paramount interest and focus of clinical research. Bone grafting and its refinements are here to stay; technique modifications will help reduce morbidity.

Clearly, the LLRS has evolved into to a society interested in both fracture healing and distraction osteogenesis.

Our common goal is to better understand these phenomena while, at the same time, improve clinical methods to more efficiently bring limb elongation and reconstruction into clinical practice.

Over the past 20 years, orthopaedic surgeons around the world have formed national societies to study the methods of distraction osteogenesis developed by Professor G. A. Ilizarov in Kurgan, USSR. A decade ago, these groups coalesced into an International ASAMI organization, which hold meetings every two years somewhere around the globe. Both the national groups and the international federation have evolved from single focus entities to ones that demonstrate interest in all modes of limb reconstruction and tissue regeneration. The breadth of papers in this symposium reflects that evolution.