J Musculoskelet Neuronal Interact 2005; 5(3):192-193

Muscle and Bone Development in Pediatrics

Foreword

Pediatric bone is booming and is rapidly growing up to join the ranks of medicine's sub-subspecialties. Only ten years ago the few pediatric contributions at major bone meetings could be unceremoniously sandwiched between presentations on Paget's disease and prostate metastases. Nowadays, full-scale scientific gatherings with hundreds of participants are dedicated exclusively to pediatric metabolic bone diseases.

Whether the quality of the research has experienced a similar upswing is a matter of debate. Pessimists argue that the field is less driven by a newly discovered scientific interest in children's bones but rather by the wider availability of densitometric equipment in pediatric hospitals. Proponents of this gloomy view maintain that the motto "buy a DXA scanner, take some kids, write a paper" pretty much sums up the reasons for the recent rush into pediatric bone. Others find it disquieting that a large number of pediatric "me too studies" uncritically subject kids to diagnostic and therapeutic approaches that were meant solely for their grandmothers.

However, there are also good reasons to be optimistic about the future of pediatric bone research. Many investigators are now taking into account that growing bones are complex three-dimensional structures that cannot be adequately described by quantifying the whiteness of their radiographic shadow images. There is also increasing awareness that bones are mainly needed to move us around and that for doing so they must form a functional unit with their movers, i.e., the muscles. More and more pediatricians are buying into the idea that bone strength must be regulated by tightly controlled feedback mechanisms and can not just be left at the whim of individual cells or current hormone levels. These are exactly the concepts that led to the creation of the Journal of Musculoskeletal and Neuronal Interactions (JMNI) about five years ago.

We therefore believe that JMNI has an important role to play in the fledgling pediatric bone field. The present special pediatric issue serves to highlight this role. We have invited contributions that look at muscle and bone development from different angles.

One of the Guest Editors sets the scene by looking at the question: How do bones get bigger?[1] As it turns out, this fundamental question so far has received mostly one-dimensional answers. There is a good deal of information on how growth proceeds in a longitudinal direction, but much less is known about bone growth in width. **Dr. Ruff** lends historical depth to the issue by reviewing changes in skeletal development over the past million or so years[2]. Readers may notice that many insights that are just starting to be appreciated in the pediatric bone field have been well known to anthropologists for decades.

Drs. Petit, Beck and Kontulainen examine the methodological aspects of performing densitometric studies on the developing skeleton[3]. This topic has been a rich source of confusion for a long time, so this article is a must read for all who perform clinical bone studies in children. **Drs. Fricke and Schoenau** provide a corresponding contribution on the methodology of muscle testing[4]. It is reassuring to discover that many things we learnt about muscle in physiology classes (and unfortunately forgot later on) still hold true and that they are actually important if we want to evaluate muscle function in children.

The next three papers delve into the mechanostat model. **Dr. Schoenau** explains the theory behind this model[5]. From there he develops a two-step diagnostic algorithm that aims at separating primary bone disorders from those that are secondary to a muscle problem. **Drs. Bass, Eser and Daly** re-examine two pet topics of pediatric bone researchers – exercise and nutrition – in light of the mechanostat model[6]. The skeletal effects of two extreme mechanical loading conditions are explored, competitive sports and spinal cord injury. The nutritional section contains a number of innovative views on the effect of nutrition on skeletal development. **Dr. Sievanen** then proposes a new model on how estrogen affects the mechanostat[7]. His new – and some might say controversial – concepts have already stimulated animated discussions at the recent Black Forest Forum for Musculoskeletal Interactions and hopefully will continue to do so after their publication.

Finally, **Drs. Munns and Cowell** provide a clinical hands-on perspective about the prevention and therapy of osteoporosis in chronically ill children[8]. Their enlightened discussion addresses some of the key questions that are confronting pediatricians who deliver clinical care for children with bone disorders.

References

1. Rauch F. Bone Growth in Length and Width: The Yin and Yang of Bone Stability. J Musculoskelet Neuronal Interact 2005; 5:194-201.
2. Ruff CB. Mechanical determinants of bone form: insights from skeletal remains. J Musculoskelet Neuronal Interact 2005; 5:202-212.
3. Petit MA, Beck TJ, Kontulainen SA. Examining the developing bone: What do we measure and how do we do

it? J Musculoskelet Neuronal Interact 2005; 5:213-224.
4. Fricke O, Schoenau E. Examining the developing muscle: why, what and how? J Musculoskelet Neuronal Interact 2005; 5:225-231.
5. Schoenau E. From mechanostat theory to development of the "functional muscle-bone-unit". J Musculoskelet Neuronal Interact 2005; 5:232-238.
6. Bass SL, Eser P, Daly R. The effect of exercise and nutrition on the mechanostat. J Musculoskelet Neuronal Interact 2005; 5:239-254.
7. Sievänen H. Hormonal influences on the muscle-bone feedback system: A perspective. J Musculoskelet Neuronal Interact 2005; 5:255-261.
8. Munns CF, Cowell CT. Prevention and therapy of osteoporosis in chronically ill children. J Musculoskelet Neuronal Interact 2005; 5:262-272.

Frank Rauch, M.D.[1]
Eckhard Schoenau, M.D.[2]

Guest Editors, JMNI

[1]Genetics Unit,
Shriners Hospital for Children,
1529 Cedar Avenue,
Montreal, H3G 1A6,
Canada
E-mail: frauch@shriners.mcgill.ca

[2]Children's Hospital,
University of Cologne,
Kerpener St 69,
50924 Cologne,
Germany
E-mail: eckhard.schoenau@uk-koeln.de