

# CORR Insights®: The 2018 Nicholas Andry Award: The Evidence Base for the Treatment of Developmental Dysplasia of the Hip: The Iowa Contribution

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## Where Are We Now?

In the current study, Weinstein and colleagues [6] summarize a research program that began at their institution more than 100 years, ago and aims toward improving our understanding of the pathophysiology, diagnosis, and treatment of

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developmental hip dysplasia (DDH). Clearly, we have come a long way. The authors document improvements in efficacy of surgical and nonsurgical methods for stabilization and reduction of the unstable hip, and they outline a DDH treatment protocol based upon reasoned interpretation of sound data. With such an abundance of information regarding DDH, then, why do pediatric orthopaedic surgeons still see patients who seem to defy our best efforts to obtain and maintain stable reductions?

One explanation might be that surgeons apply the methods described in this article, but they do not have complete mastery of the techniques. Despite a great deal of science dedicated to it, DDH treatment remains an art that involves subtle judgment calls, surgical expertise, talent with advanced casting techniques, interpretation of radiographs that can be difficult to read, and clinical acumen in dealing with patients and parents. Unfortunately, surgeons vary widely in these abilities. Knowledge of the methods are no more likely to result in a stable, concentric hip reduction than

are a few lessons in tennis are to deliver a major tournament win.

## Where Do We Need to Go?

We know a great deal about the pathophysiology of DDH, but we know little about its etiology. It remains a diagnosis of exclusion, entertained after other causes of hip instability such as arthrogyrosis, neurologic disease, spinal dysraphism, and obvious syndromes are ruled out. Yet, the borderline between classic DDH and teratologic DDH is often not clear. What is clear is that the response of teratologic hips to standard treatment is not as predictable as it is with classic DDH because we don't completely understand the causes of either classic DDH or teratologic DDH. It seems clear that some subtypes of DDH are more difficult to treat, and these require different—and in some patients, more-aggressive—approaches to treatment.

Another problem—one that Weinstein and colleagues [6] are striving to overcome—is that we do not generally follow our patients for long enough to see the true end results of our treatments. The long-term results of their study are sobering. Many of their patients have not done as well as we might have expected. A caveat, of

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course, is that 50-year followups are generally the product of 50-year-old techniques. Nevertheless, a 42% overall incidence of arthroplasty in their latest series [6] is unexpected and important information that requires further analysis.

Several other topics also call for deeper inquiry. First, proximal femoral growth disturbance (PFGD) is associated with subsequent instability, recurrent acetabular dysplasia, and osteoarthritis. A great deal of thought has gone into trying to minimize this problem. Despite this, severe PFGD is seen in at least 5% of patients in virtually all clinical series of patients treated with reduction. [3] As Weinstein and colleagues show, although most surgeons consider this to result from avascularity, evidence to support this premise is lacking. We need to know more about PFGD, its etiology, variations, consequences, and appropriate treatment.

We also need to further elucidate the long-term problems that patients with DDH experience. This will be a continuing need as we assess and compare the results of today to the results of yesterday. Do our suspected improvements of today really create better long-term scores on validated outcome measures such as the Iowa Hip Scale? Only time will tell, and even then, only if we do careful long-term evaluations. On that topic, patients with DDH are inevitably exposed to radiographs. Due to the proximity of the hip to the ovaries, this exposure should be of concern. We need more information regarding its importance and means for its minimization.

Finally, casting has been a mainstay of postoperative management of DDH. It is also often inadequate, as redislocation can occur despite a cast. [3] We need to look carefully at this

problem—can we find another way to maintain reduction or improve the casts we use today so that they are more effective at stabilizing the hip?

### How Do We Get There?

With their research, Weinstein and colleagues [6] accomplished what few others could. Their article is not just about DDH; they also outline the factors that made this research possible, and in these days of cost-cutting and emphasis upon clinical productivity at the expense of research, this contribution is at least as important as their observations regarding DDH. Their main points regarding the conduct of research, therefore, are highly relevant to any discussion of future directions and bear restating.

Those factors include: (1) An institutional commitment to the production and use of evidence-based medicine, as manifested in accessible and complete medical records, institutional financial support of research activities, and an institutional culture that values clinical and laboratory research, encourages and rewards the participation of its practitioners, and provides their clinicians the time to accomplish good research. (2) A dedication to the scientific method, with alternating use of both inductive and deductive reasoning, the testing of hypotheses by careful assessment of the consequences of their application, and the willingness to alter beliefs when contradicted by objective data. (3) A mentorship program wherein these values are passed from generation to generation. The University of Iowa has been successful because the values of Steindler were passed to

Ponseti and onward to Weinstein and beyond. Without this chain of mentors, their values would not have persisted, and their long-term clinical research would not have been possible.

These factors, unfortunately, are falling by the wayside in many of our university hospitals, and to the extent that they are de-emphasized, clinical research will suffer. Careful prospective clinical studies are essential to improved patient care, but are increasingly difficult to do in today's healthcare environment.

We should be innovative, also, in our use of bench-top research. For example, many canine species have a high incidence of DDH [5]. Collaboration with our veterinary colleagues might prove fruitful in discerning the etiology of DDH, particularly regarding its genetic components.

With the advent of genomic arrays, whole genome sequencing, and CRISPR, genetic methods have been revolutionized during the past decade. These techniques should also be applied to the known genetic linkages of DDH and other linkages to be discovered in the future [1, 2, 4]. We know so much now regarding the control of skeletal growth that we did not know a decade ago. Applying this new information to this old problem cannot help but be fruitful.

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