

ABJS Carl T. Brighton Workshop on Hip Preservation Surgery

Editorial Comment

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Interest in hip-preserving surgery has substantially increased during recent years. The increased interest is based on newly added knowledge of underlying pathomechanical disorders. Long-known major reasons for early hip dysfunction or premature onset of osteoarthritis are developmental or acquired hip deformities, including developmental dysplasia of the hip (DDH), childhood affections with residual deformities after Legg-Calvé-Perthes disease (LCPD) or slipped capital femoral epiphysis (SCFE), and sequelae of hip trauma or infection. Additional and sometimes subtler deformities can also contribute to early hip osteoarthritis. Harris and colleagues [5, 12] described one of the earliest recognized and perhaps best known of these deformities: the “pistol grip” deformity of the femoral head. A few decades later, a new pathomechanism called femoroacetabular impingement (FAI) provided an explanation and a substantial link between a pistol grip deformity and/or acetabular overcoverage with hip osteoarthritis. This concept was developed by Reinhold Ganz and his coworkers [4]. The concept of FAI has substantially contributed to the understanding of a painful hip in the young adult and, together with further developments of surgical techniques, has enlarged the



Fig. 1 Dr. Klaus-Arno Siebenrock is shown.

spectrum of joint-preserving surgeries. The main goal of this workshop can be condensed to three questions according to the concept of the ABJS Carl T. Brighton workshops: (1) Where are we now in the field of joint-preserving surgery? (2) Where do we need to go? (3) How do we get there?

Hip ontogenesis comprises the development from its fetal origin to the adult shape. There is current evidence that hip pathomorphologies may arise subsequent to genetic factors and to abnormal load pattern or adverse growth events, eg, LCPD or SCFE. Genetic influences most likely are not based on a single gene but are polygenic and complex [6]. Abnormal orientation or shape of the acetabulum as in DDH and acetabular retroversion are not isolated features of the hip itself but are associated with an abnormal orientation and growth of the entire innominate bone [14].

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Fig. 2 Dr. Christopher L. Peters is shown.

Standard imaging of the hip with a three-radiograph series, including an AP pelvis, a Dunn view, and a frog lateral, has a high specificity and sensitivity for hip malformations [11]. Future modern imaging techniques with MRI should focus on the accuracy and reproducibility of detecting cartilage damage. Delayed gadolinium-enhanced MRI of cartilage techniques so far provide the best results in predicting early failure of the hip after acetabular reorientation for DDH [9].

There is general agreement that symptomatic acetabular dysplasia in the adolescent or young adult is best treated with acetabular reorientation. Current challenges include defining optimum correction of the acetabulum and the role of arthrotomy, intraarticular work, and arthroscopy. There is increased recognition of coexisting impingement and dysplasia, underscoring the importance of accurate preoperative assessment of morphology and hip pathomechanics. The challenging patient with so-called borderline acetabular dysplasia (lateral center-edge angle of 20°–25°) is increasingly recognized, as is the importance of preserving the labrum in these patients [7]. Studies of periacetabular osteotomy and rotational osteotomy from Europe, North America, and Japan consistently show relief of pain and restoration of function, provided strict patient selection criteria are met [15].

The hip-motion conflict phenomenon known as FAI is now understood to cause labral and hyaline cartilage damage. Young adults with more severe morphologic abnormalities and high-level vigorous athletes (football, soccer, hockey) are at higher risk of developing FAI [8]. Surgical treatment mainly with femoral and/or acetabular osteochondroplasty can be achieved with either open or arthroscopic techniques. With surgical treatment, pain relief and function appear to be greater when the acetabular

labrum is preserved rather than débrided. Identification and treatment of the chondral delamination injury particularly associated with cam-type impingement are crucial. Methods such as microfracture, resection, and cartilage restoration are currently employed without evidence of superiority, indicating a need for future study. Several studies now indicate the deep acetabulum (coxa profunda) is not necessarily associated with acetabular overcoverage or pincer impingement [2].

Typical childhood diseases with substantial hip deformities include LCPD and SCFE. Deformities after LCPD may lead to pain and dysfunction by a rather complex pathomechanism including intra- and extraarticular impingement and joint instability [13]. Since there is a wide individual variation of deformity, thorough identification of all aspects remains difficult. This leads to controversy about the required surgical steps and the definition of who needs additional acetabular reorientation to improve outcomes [3]. An improved understanding will require modern three-dimensional techniques to analyze joint kinematics. Although one recent report of joint-preserving surgery in LCPD [1] describes improvement in pain and ROM, larger combined data collection to demonstrate successful outcome is needed. Even more controversial is the treatment of SCFE. Treatment results depend on different issues, such as amount of deformity, status of the physis, and surgeon's experience. Pinning in situ and anatomic alignment by a modified Dunn procedure are the main two counterpoints. Residual deformity seems to be a major determinant of long-term function [10] and many surgeons prefer open surgical correction. Delayed initial diagnosis by radiographic misinterpretation and underestimation of the deformity are still common and require additional educational efforts. Long-term studies need to show whether accurate initial anatomic head alignment provides durable pain relief and function [16].

The substantial growth of the field of hip preservation over the past decade has created unique challenges for orthopaedic education and training, as well as identification of optimum provider care models. It is apparent incorporation of the basic principles of hip preservation has only sporadically been adopted into residency and fellowship training programs. A number of academic programs have recently created specialized hip preservation services to provide a spectrum of surgical skill sets and to better address education and training needs of postgraduates. The field of hip preservation may well be in the infant stages of becoming its own subspecialty and future challenges may include identification of an international governing body or society.

The ABJS Carl T. Brighton workshop was envisioned as a forum in which world authorities could gather and ultimately advance a specific field related to orthopaedic

surgery. The format of a small group of experts assembled in one room with a small audience is unique and beguiling. The faculty and the editors universally found the symposium to be intellectually stimulating. We are grateful for the opportunity to become more familiar with each other and the faculty on a professional and personal level. We are most appreciative of the faculty for volunteering their time, and we sincerely thank the Association of Bone and Joint Surgeons® for allowing us to organize and edit this important symposium on hip preservation.

References

1. Albers CE, Steppacher SD, Ganz R, Siebenrock KA, Tannast M. Joint-preserving surgery improves pain, range of motion, and abductor strength after Legg-Calvé-Perthes disease. *Clin Orthop Relat Res.* 2012;470:2450–2461.
2. Anderson LA, Kapron AL, Aoki SK, Peters CL. Coxa profunda: is the deep acetabulum overcovered? *Clin Orthop Relat Res.* 2012 August 17 [Epub ahead of print].
3. Clohisy JC, Ross JR, North JD, Nepple JJ, Schoenecker PL. What are the factors associated with acetabular correction in Perthes-like hip deformities? *Clin Orthop Relat Res.* 2012 August 16 [Epub ahead of print].
4. Ganz R, Parvizi J, Beck M, Leunig M, Notzli H, Siebenrock KA. Femoroacetabular impingement: a cause for osteoarthritis of the hip. *Clin Orthop Relat Res.* 2003;417:112–120.
5. Harris WH. Etiology of osteoarthritis of the hip. *Clin Orthop Relat Res.* 1986;213:20–33.
6. Hogervorst T, Eilander W, Flikkers JT, Meulenbelt I. Hip ontogenesis: how evolution, genes, and load history shape hip morphotype and cartilotype. *Clin Orthop Relat Res.* 2012 August 28 [Epub ahead of print].
7. Kalore NV, Jiranek WA. Save the torn labrum in hips with borderline acetabular coverage. *Clin Orthop Relat Res.* 2012 July 19 [Epub ahead of print].
8. Kapron AL, Anderson AE, Aoki SK, Phillips LG, Petron DJ, Toth R, Peters CL. Radiographic prevalence of femoroacetabular impingement in collegiate football players: AAOS exhibit selection. *J Bone Joint Surg Am.* 2011;93:e111(1–10).
9. Kim SD, Jessel R, Zurakowski D, Millis MB, Kim YJ. Anterior delayed gadolinium-enhanced MRI of cartilage values predict joint failure after periacetabular osteotomy. *Clin Orthop Relat Res.* 2012 August 21 [Epub ahead of print].
10. Millis MB, Siebenrock KA; Session Participants. Report of breakout session: defining parameters for correcting the acetabulum during a pelvic reorientation osteotomy. *Clin Orthop Relat Res.* 2012 July 10 [Epub ahead of print].
11. Nepple JJ, Martel JM, Kim YJ, Zaltz I, Clohisy JC; ANCHOR Study Group. Do plain radiographs correlate with CT for imaging of cam-type femoroacetabular impingement? *Clin Orthop Relat Res.* 2012 August 29 [Epub ahead of print].
12. Stulberg S, Cordell L, Harris W, Ramsey P, MacEwen G. Unrecognized childhood hip disease: a major cause of idiopathic osteoarthritis of the hip. In: *Proceedings of the Third Open Scientific Meeting of the Hip Society.* Rosemont, IL: The Hip Society; 1975:212–228.
13. Tannast M, Hanke M, Ecker TM, Murphy SB, Albers CE, Puls M. LCPD: reduced range of motion resulting from extra- and intraarticular impingement. *Clin Orthop Relat Res.* 2012;470:2431–2440.
14. Tannast M, Pfannebecker P, Schwab JM, Albers CE, Siebenrock KA, Buchler L. Pelvic morphology differs in rotation and obliquity between developmental dysplasia of the hip and retroversion. *Clin Orthop Relat Res.* 2012 July 14 [Epub ahead of print].
15. Yasunaga Y, Yamasaki T, Ochi M. Patient selection criteria for periacetabular osteotomy or rotational acetabular osteotomy. *Clin Orthop Relat Res.* 2012 August 16 [Epub ahead of print].
16. Ziebarth K, Zilkens C, Spencer S, Leunig M, Ganz R, Kim YJ. Capital realignment for moderate and severe SCFE using a modified Dunn procedure. *Clin Orthop Relat Res.* 2009;467:704–716.