Perceptions Concerning Hip Resurfacing from Attendees at The Second Annual U.S. Comprehensive Course on Total Hip Resurfacing Arthroplasty

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Abstract

Resurfacing hip arthroplasty represents a new, alternative technology to standard total hip arthroplasty. We examined the perceptions about resurfacing after the Second Annual United States Comprehensive Course on Total Hip Resurfacing Arthroplasty, which was a multi-company sponsored educational event to advance general knowledge, basic science, and surgical skills relevant to this field. The course led to a substantial increase in knowledge concerning resurfacing as evaluated from pre- and post-tests. The perceptions concerning indications, patient selection, and beliefs of the course attendees are reported.

Arthritis of the hip is a common condition affecting people worldwide. Degenerative changes of the hip joint progress relentlessly, requiring eventual treatment with hip arthroplasty in a number of patients. It is estimated that over 330,000 hip arthroplasty procedures were performed in the United States (U.S.) in 2003.1 While total and hemi-hip arthroplasty are well-established techniques for the treatment of degenerative changes to the hip, newer techniques, such as hip resurfacing, have been developed that minimize the loss of native bone stock. In addition to preserving patients’ bone to allow future revision to a primary total hip arthroplasty, this technique may allow patients to achieve a higher postoperative activity level.2-4

To effectively incorporate new technologies like hip resurfacing into their practices, orthopaedic surgeons need effective means for learning new skills and procedures, as well as to become familiar with the indications, benefits, and potential complications of these techniques. These concerns have been recognized by the U.S. Food and Drug Administration (FDA), which has included a mandatory training program requirement as part of all current generation resurfacing implant device approvals to date.5,6 Typically, the theoretical and practical aspects of these new technologies have been taught by single surgeons on a one-on-one basis, as well as at small regional and sometimes national meetings. Most of these meetings have been device-specific, i.e., sponsored by one company or manufacturer, giving surgeons limited exposure to the full breadth of surgical techniques and devices used with the technology. The U.S. Comprehensive Course on Total Hip Resurfacing Arthroplasty was conceived as a multi-company sponsored educational event, covering the broad range of theoretical and practical issues associated with this technology. The second annual edition of this course was held in October 2008, with the goal of providing orthopaedic surgeons and other health professionals with a comprehensive educational experience of total hip resurfacing. As such, over 30 instructors from both the U.S. and abroad participated in the lecture curriculum, which included basic science, clinical research, clinical results, and surgical techniques; their expertise collectively represented the experience of eight major orthopaedic device companies.

The purpose of this report is to examine the impact of this comprehensive course on the education of orthopaedic surgeons and other allied healthcare professionals. We also evaluated the perceptions of the attendees of hip resurfacing, as well as their knowledge, skill, and experience with the procedure, in an effort to further define important...
Table 1  Session Topics at the Second Annual U.S. Comprehensive Hip Resurfacing Course

1. Historical Background
   History of Materials and Failure Mechanisms in Hip Resurfacing
   Evolution of Metal-on-Metal Hip Resurfacing
   What Is on the Technology Horizon for Resurfacing?
   Why I Adopted Resurfacing After 4,000 Total Hip Replacements

2. Basic Science of Hip Resurfacing
   Metallurgy, Tribology, and Hip Resurfacing
   Design Considerations for Resurfacing Prostheses
   Femoral Head Blood Flow During Hip Resurfacing
   Biomechanics of Femoral Neck Fracture
   Biomechanical Results of Total Hip Resurfacing
   Retrieval Analysis of Modern Day Total Hip Resurfacing
   Femoral Cementing Techniques for Hip Resurfacing

3. Key Concepts for the Practice of Hip Resurfacing
   Patient Selection and Preoperative Planning
   Clinical Outcomes of Resurfacing versus Hip Replacement
   Functional Comparisons of Resurfacing and Total Hip Replacement
   Integrating Resurfacing into a Total Hip Practice

4. Lessons from Experience
   My Three Most Important Lessons (five separate talks representing five points of view)

5. Special Indications for Hip Resurfacing
   Abduction Angle and Metal Ion Levels in Resurfacing
   Extra-Articular Deformities and the Role of Hip Resurfacing
   Total Hip Resurfacing in Osteonecrosis and Perthes
   Total Hip Resurfacing in Rheumatoid Arthritis
   Resurfacing in Congenital Dysplasia
   Why I Choose Standard Hip Replacement

6. Complications, Pitfalls, and Avoidance
   Fractures Following Resurfacing
   Peri-Prosthetic Fracture Following Resurfacing
   Acoustic Phenomena in Resurfacing
   Avoiding the Learning Curve
   Evaluation of Painful Resurfacing
   Conversion of Failed Resurfacing to Total Hip Replacement

7. Special Techniques
   What Are the Desired Component Positions for Resurfacing?
   New Techniques and Instrumentation for Resurfacing
   Cementless Femoral Components
   Computer-Assisted Resurfacing: My Approach (two talks)

educational requirements concerning resurfacing.

Materials and Methods

The Second Annual U.S. Comprehensive Course on Total Hip Resurfacing Arthroplasty was a one and a half day orthopaedic course divided into seven sessions, with a total of approximately 40 lectures on various aspects of hip resurfacing. These topics included historical background, basic science, key concepts, lessons from experience, special indications, complications, pitfalls, as well as special techniques. The complete list of topics can be found in Table 1. Throughout the program, course participants were polled using a wireless electronic audience response system (TurningPoint, Turning Technologies LLC, Youngstown, Ohio). Participation in these questionnaires was voluntary, and the responses were collected anonymously, with no means of associating responses to an individual attendee.

At the start of the meeting, following some introductory remarks, a pre-test, consisting of 10 multiple-choice questions, was administered to poll the audience on their perceptions regarding the general indications and techniques for hip resurfacing (Table 2). These questions were selected by the course directors, based on their experience with hip resurfacing techniques and their knowledge of the relevant body of academic literature. This same 10-question survey was administered as a post-test immediately after the conclusion of the course curriculum, prior to the closing remarks. In addition, immediately following the conclusion of the morning sessions on the first day of the course, a general multiple-choice survey was conducted to determine the demographic profile of the course participants, as well as to poll the audience regarding personal perceptions and experience with hip resurfacing, opinions on outcomes of the procedure, and views on the indications for this surgery. The collected survey data was electronically exported to a Microsoft® Excel (version 11, Microsoft Corporation, Redmond, Washington) spreadsheet for collation and analysis.

Results

Of 185 course attendees, we received 103 survey responses (response rate 56%). Eighty-nine men and 14 women, who had a mean age of 48 years, responded to the survey. Orthopaedic surgeons (68%) were the main respondents, Others included company representatives, nurses, and physician assistants. Approximately 50% of the surgeons were fellowship-trained in hip surgery, with 30% general orthopaedic attendings. Participants’ professional roles and experience levels from the survey can be found in Figure 1.

Based on the results of the pre-test, the baseline knowledge of the course attendees regarding hip resurfacing was strong, with 8 of the 10 questions answered correctly by more than 50% of respondents. A comparison of the results of the pre- and post-tests led to a substantial increase in the number of correct answers for 9 of the 10 questions (Fig. 2).

Course participants reflected a wide variety of experience with hip resurfacing arthroplasty, with approximately 12% of the surgeons performing greater than 100 resurfacing procedures per year, as contrasted with 60% of the surgeons performing less than 25 per year. Sixty-
two percent of the surgeons reported that hip resurfacings comprised less than 10% of their overall hip arthroplasty volume, while only 10% indicated that resurfacing encompassed greater than 50% of their hip arthroplasty practice. Two-thirds of the respondents felt that hip resurfacing was more difficult to perform than a standard total hip

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**Table 2** Pre-Test and Post-Test Questions from the Second Annual U.S. Comprehensive Hip Resurfacing Course

1. *The best results of resurfacing would be expected in a:*
   - 60-year-old male
   - 40-year-old female
   - 40-year-old male*
   - 60-year-old female

2. *Resurfacing arthroplasty represents about what percentage of all total hip arthroplasties in countries where the technology is widely available?*
   - 0-5%
   - 6-10%*
   - 11-15%
   - 16-20%

3. *Resurfacing is most contraindicated in:*
   - Osteonecrosis
   - Perthes
   - Dysplasia
   - Rheumatoid arthritis*

4. *Males younger than 65 years of age are expected to have what percentage survival with resurfacing at five years?*
   - 100%
   - 98%*
   - 96%
   - 90-95%

5. *All of these patient groups have higher risks of resurfacing failure except:*
   - Females
   - Males more than 65 years old
   - Patients with osteoporosis
   - Males less than 25 years old*

6. *The majority of early revisions for resurfacing occur because of:*
   - Loosening of the acetabular component
   - Loosening of the femoral component
   - Femoral neck fractures*
   - Component malposition

7. *The best results of resurfacing have been reported for which approach?*
   - Anterolateral
   - Posterior
   - Anterior
   - No difference*

8. *A resurfacing prosthesis with a diametrical clearance of 100 microns, compared with one with a clearance of 250 microns, should lead to what effect on urine cobalt excretion?*
   - Lower urine cobalt excretion*
   - Higher urine cobalt excretion
   - No effect on urine cobalt excretion
   - We do not know this answer

9. *In most studies to date, patients who have undergone resurfacing generally have what level of activity when compared with patients who have undergone standard hip arthroplasty?*
   - Higher activity*
   - Lower activity
   - Same activity
   - Cannot tell because studies are flawed

10. *The fixation that should most likely not be used for resurfacing is:*
    - Cemented femoral components
    - Cementless femoral components
    - Cemented acetabular components*
    - Cementless acetabular components

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*Best answers*
arthroplasty, with only 4% of surgeons feeling that the latter were easier to do. Most respondents believed that a minimum of 30 resurfacings were necessary to achieve competency. Two-thirds of the surgeons used a posterior approach, compared with approximately 20% who used an anterolateral approach for the procedure. Fifty-eight percent of respondents believed that the true incidence of metal allergy or hypersensitivity reactions was less than 1%, and another 20% of respondents believed the incidence to be approximately 1%. When the group was asked which hip arthroplasty they would personally prefer to receive, 75% of the respondents would choose a resurfacing. The results of questions regarding personal perception and experience with hip resurfacing can be found in Figure 3.

Concerning outcomes of the procedure, most of the respondents felt that resurfacings were similar to standard total hip arthroplasties. However, 64% of the respondents felt that resurfacings led to higher activity levels. Nevertheless, resurfacings were believed to have similar general outcomes, functional results, range of motion, bone loss on the acetabular side, rate of recovery, and gait. Sixty percent of the respondents felt that the complication rates were comparable, although 30% felt that they would be higher than a standard total hip arthroplasty.

In terms of patient selection, 84% of the respondents felt that resurfacing would be the procedure of choice in a young (under 50 years of age) men. A large majority (65%) would also utilize it for men who are over 60 years of age, but 74% would never use it in a women of that age group. Fifty-five percent of the respondents said they would perform the procedure in a patient with osteonecrosis, and 65% said they would not use it in a patient with rheumatoid arthritis. Although a majority (58%) would not offer it to a woman of childbearing age, 37% of respondents would.

Discussion

The results of the pre and post-test results suggest that the Second Annual US Comprehensive Hip Resurfacing Course achieved its objective in educating the attendees concerning the general knowledge aspects of resurfacing, with the percentage of correct responses increasing for 8 of the 10 questions. Additionally, 97% of respondents noted that the course met or exceeded their expectations, and 88% remarked that the quality of the course was above average or excellent. Resurfacing is a relatively new surgical procedure that may have a long learning curve. Marker and colleagues demonstrated a high fracture rate in the first group of 70 patients who underwent resurfacing by a single surgeon; after the initial learning curve, the rate decreased to acceptable levels. This occurrence was also found in a study by Della Valle and coworkers that revealed a high number of peri-prosthetic fractures when multiple surgeons each performed the procedure on a relatively small number of patients; the fracture rate markedly declined when the procedure was performed by four highly experienced surgeons who were able to advance past the initial learning curve. Based on these studies, it appears prudent to have as much training as possible for this new technique. It is possible that surgeons underestimate the number of cases needed to become proficient with this procedure, given that 44% of respondents in our survey believed that 30 resurfacings or fewer need to be performed to achieve competency.

Orthopaedic surgeons require efficient methods for learning new surgical techniques while in practice. Focused comprehensive courses are popular methods, but the quality of the course may have a marked impact on the educational value of this approach for participating surgeons. It is vital that these courses be monitored and assessed on a regular basis to ensure that learning objectives are met and that future
Figure 3  Responses to questions concerning participant personal experience with hip resurfacing.

editions of these courses will be optimally tailored to match participants’ educational needs. In addition to helping with this process of assessment and with improving participant learning and information retention,9,11 audience response systems provide a readily available source for information about attendees’ expectation, beliefs, and knowledge of the
field. It was with objectives and purposes in mind that this study was undertaken to understand the effects of a comprehensive course on knowledge of resurfacing, as well as the beliefs about this procedure.

There are several limitations of this survey. First, the surgeons and participants attending this resurfacing course are a very self-selected group and are most likely to perform resurfacing or undergo this type of procedure in their own practice. In addition, although 68% of the attendees were orthopaedic surgeons, there were various other interested allied healthcare professionals, whose background knowledge or specific interest in hip resurfacing may not be congruent with those of orthopaedic surgeons.

The best method for training and credentialing surgeons in practice for new surgical procedures such as resurfacing remain to be established. It is certainly believed that a comprehensive course can be adequate for many surgeons and may simultaneously assist manufacturers in complying with the surgeon education and training requirements mandated by regulatory bodies. It is hoped that multiple, validated methods of education, such as one-on-one training and local courses, as well as comprehensive programs similar to the one reviewed in this report, will be effectively utilized for the education and training of orthopaedic surgeons in new and promising technologies such as total hip resurfacing arthroplasty.

Disclosure Statement
Michael A. Mont, M.D., is a consultant for Stryker Orthopaedics and Wright Medical Technology. Thomas P. Schmalzried, M.D., is a consultant for Wright Medical Technology and Depuy Orthopaedics. None of the other authors have a financial or proprietary interest in the subject matter or materials discussed, including, but not limited to, employment, consultancies, stock ownership, honoraria, and paid expert testimony.

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