Clinical Policy Bulletin:  
Joint Resurfacing

Revised April 2014

Number: 0661

Policy

I. Aetna considers metal-on-metal hip resurfacing by means of a Food and Drug Administration (FDA)-approved device (e.g., Birmingham Hip Resurfacing (BHR) System, Cormet 2000) a medically necessary alternative to total hip arthroplasty for physically active non-elderly (less than 65 years of age) adult members when the following criteria are met:

A. Member has advanced joint disease demonstrated by:

1. Pain and functional disability that interferes with activities of daily living (ADLs) from injury due to osteoarthritis, avascular necrosis, or post-traumatic arthritis of the hip joint; and

2. Limited range of motion (ROM), antalgic gait, and pain in hip joint with passive ROM on physical examination: and

3. Radiographic or MRI supported evidence of severe osteoarthritis (as evidence by 2 or more of the following: subchondral cysts, subchondral sclerosis, periartricular osteophytes, joint subluxation, bone on bone articulation or joint space narrowing) of hip joint primarily affecting the femoral head, or osteonecrosis (avascular necrosis) of the femoral head when the disease is detected early and there is less than 50 % involvement of the femoral head; and

4. Member would otherwise require a conventional primary total hip replacement, but is likely to live longer than the functional lifespan of a traditional prosthesis; and

5. History of or unsuccessful conservative therapy (non-surgical medical management) that is clearly addressed in the medical record (see Note). If conservative therapy is not appropriate, the medical record must clearly document why such approach is not reasonable: Members should have at least 12 weeks of non-surgical treatment documented in the
medical record, including all of the following, unless contraindicated:

a. Anti-inflammatory medications or analgesics; and
b. Flexibility and muscle strengthening exercises, and
c. Activity modification; and
d. Supervised physical therapy (ADLs diminished despite completing a plan of care); and
e. Weight reduction as appropriate; and
f. Assistive device use, where appropriate; and
g. Therapeutic injections into the hip, where appropriate.

B. Hip resurfacing is considered not medically necessary in persons with any of the following contraindications:

1. Active infection of the joint or active systemic bacteremia that has not been totally eradicated; or
2. Active skin infection (exception recurrent cutaneous staph infections) or open wound within the planned surgical site of the hip; or
3. Allergy to metals used in resurfacing (e.g., cobalt, chromium or alumina); or
4. Morbid obesity (body mass index (BMI) greater than 40); or
5. Member has inadequate bone stock to support the device; or
6. Member has degenerative arthritis affecting both the femoral head and the acetabular surface or the member has been diagnosed with avascular necrosis (osteonecrosis) of the femoral head where more than 50% of the femoral head is affected; or
7. Member has severe anatomic deformity of the femoral head; or
8. Member is skeletally immature; or
9. Persons with moderate-to-severe renal insufficiency; or
10. Multiple femoral neck cysts greater than 1 cm in diameter; or
11. Vascular insufficiency, muscular atrophy, or neuromuscular disease severe enough to compromise implant stability or postoperative recovery; or
12. Immunosuppression (i.e., AIDS) or high doses of corticosteroids; or
13. Females of child-bearing age due to the unknown effect of metal ion release on the fetus.

C. For members with significant conditions or co-morbidities, the risk/benefit of hip resurfacing should be appropriately addressed in the medical record.

II. Aetna considers metal-on-metal hip resurfacing experimental and investigational for developmental dysplasia of the hip and for all other
indications because its effectiveness for these indications has not been established.

III. For criteria for revision of hip resurfacing arthroplasty, see CPB 0287 - Total Hip Replacement.

IV. Aetna considers shoulder resurfacing, including total and hemi-resurfacing, experimental and investigational for the treatment of glenohumeral arthritis, humeral head fractures, osteochondral lesions, and for all other indications because of insufficient evidence of its effectiveness.

V. Aetna considers knee resurfacing/partial knee resurfacing (e.g., Makoplasty)/patellar resurfacing experimental and investigational because their effectiveness has not been established.

See also CPB 0287 - Total Hip Replacement, and CPB 0660 - Unicompartmental, Bicompartmental, and Bi-unicompartmental Knee Arthroplasties.

Background

Hip Resurfacing:

Hip resurfacing has been promoted as an alternative to total hip replacement or for younger patients, to watchful waiting, and involves the removal and replacement of the surface of the femoral head with a hollow metal hemisphere. This hemisphere fits into a metal acetabular cup. The technique conserves femoral bone, maintains normal femoral loading and stresses. Because of bone conservation, it may not compromise future total hip replacements (THRs).

The metal-metal femoral resurfacing technique developed by Amstutz et al (1986) has been proposed as an alternative to metal-on-metal THR. In femoral resurfacing, the femoral head is re-shaped and capped with a metal ball, but the femoral head is not removed as in THR. Compared to THR, femoral resurfacing allows preservation of much more of the patient's own bone. The advantages of femoral resurfacing over THR is that it is less invasive, there is reduced thigh pain since there is no stem in the femoral canal, and that it may allow patients to be more active (an advantage especially for younger patients because the risk of dislocation is theoretically reduced because of the larger ball. In addition, if the femoral resurfacing fails, the surgeon can perform a THR. Unfortunately, the early designs tried by Amstutz had high failure rates. In addition, there are theoretical concerns that resurfacing may increase the risk of avascular necrosis of the femoral head. Femoral resurfacing may become a first choice procedure (relative to THR) for patients with osteonecrosis of the femoral head, especially for young, active patients.

The United Kingdom National Institute for Clinical Excellence (2002) systematically reviewed the literature supporting hip resurfacing. The NICE review noted that only short-term (less than 5 years) outcomes data are available on metal-on-metal resurfacing hip arthroplasty. Long-term data are important because for THR, failure rates have been noted to increase substantially beyond 10 years. There are no randomized controlled clinical trials of metal-on-metal hip resurfacing.
arthroplasty. In addition, there are no studies directly comparing the outcomes of metal-on-metal resurfacing hip arthroplasty to THR or other alternatives, which limit the conclusions one can draw about the comparative effectiveness of these procedures.

The NICE recommended that metal-on-metal hip resurfacing be considered an option for people with advanced hip disease who would otherwise receive a conventional primary THR and are likely to live longer than the device is likely to last.

The NICE noted that, when considering a metal-on-metal hip resurfacing, surgeons should bear in mind:

- How active the individual is
- That the evidence resurfacing available at the moment for the clinical effectiveness and cost effectiveness of metal-on-metal hip comes mainly from studies that have involved people less than 65 years of age.

The NICE recommended that surgeons choose a device for hip resurfacing for which there is at least 3 years’ evidence. This evidence should show that the device is likely to meet a target of less than 1 in 10 devices needing replacing over 10 years.

In an assessment prepared for the Canadian Coordinating Office for Health Technology Assessment, Allison (2005) stated that minimally invasive hip resurfacing uses a smaller surgical incision and new techniques to expose the hip joint. Possible advantages include less damage to soft tissue, muscle and bone; smaller scars; less blood loss; and shorter hospital stays and rehabilitation. Possible disadvantages include damage to soft tissue, femur fracture, neurovascular damage, implant mal-position and a longer operating time.

Metal-on-metal resurfacing arthroplasty also represents an alternative for the treatment of patients with hip osteoarthritis. Daniel and colleagues (2004) stated that the results of conventional hip replacement in young patients with osteoarthritis have not been encouraging even with improvements in the techniques of fixation and in the bearing surfaces. Modern metal-on-metal hip resurfacing was introduced as a less invasive method of joint reconstruction for this particular group. The authors presented their findings of a series of 446 hip resurfacings (n = 384) performed by one of the authors using cemented femoral components and hydroxyapatite-coated uncemented acetabular components with a maximum follow-up of 8.2 years (mean of 3.3 years). Their survival rate, Oxford hip scores and activity levels were reviewed. Six patients died due to unrelated causes. There was 1 revision (0.02 %) out of 440 hips. The mean Oxford score of the surviving 439 hips is 13.5. None of the patients was told to change their activities at work or leisure; 31 % of the men with unilateral resurfacings and 28 % with bilateral resurfacings were involved in jobs that they considered heavy or moderately heavy; 92 % of men with unilateral hip resurfacings and 87 % of the whole group participate in leisure-time sporting activity. The extremely low rate of failure in spite of the resumption of high level occupational and leisure activities provided early evidence of the suitability of this procedure for young and active patients with osteoarthritis.
Lilikakis et al (2005) reported preliminary results of an uncemented, hydroxyapatite-coated femoral implant for metal-on-metal hip resurfacing. The pre-operative diagnosis was osteonecrosis in 1 patient, chondrolysis in 1 patient, and osteoarthritis in the remaining 64 patients (68 hips). The survival rate of 70 implants after at least 2 years follow-up was 98.6 %, with an excellent clinical outcome. There have been no femoral fractures, aseptic loosening, or radiolucencies around the stem. Thinning of the femoral neck at the inferomedial cup-neck rim has been a frequent radiological finding but with no clinical implication so far.

Pollard et al (2006) compared the 5- to 7-year clinical and radiological results of the metal-on-metal Birmingham hip resurfacing with a hybrid total hip arthroplasty in 2 groups of 54 hips, matched for gender, age, body mass index and activity level. Function was excellent in both groups, as measured by the Oxford hip score, but the Birmingham hip resurfacings had higher University of California at Los Angeles activity scores and better EuroQol quality of life scores. The total hip arthroplasties had a revision or intention-to-revise rate of 8 %, and the Birmingham hip resurfacings of 6 %. Both groups showed impending failure on surrogate endpoints. Of the total hip arthroplasties, 12 % had polyethylene wear and osteolysis under observation, and 8 % of Birmingham hip resurfacings demonstrated migration of the femoral component. Polyethylene wear was present in 48 % of the hybrid hips without osteolysis. Of the femoral components in the Birmingham hip resurfacing group which had not migrated, 66 % had radiological changes of unknown significance.

An assessment by the BlueCross BlueShield Association Technology Evaluation Center (BCBSA, 2007) concluded that metal-on-metal total hip resurfacing meets the TEC criteria. The assessment found that a substantial body of evidence shows hip resurfacing “is associated with consistent and strong symptomatic and functional improvements at follow-up times up to 5 years.” The assessment also found that hip resurfacing results are comparable to those obtained with current generation total hip arthroplasty at similar time points in patients younger than 65 years of age. The assessment noted that hip resurfacing differs procedurally from total hip arthroplasty in conserving a patient's native femoral bone neck. When hip resurfacing patients subsequently require revision to total hip arthroplasty, the operation is technically similar to primary total hip arthroplasty and likely avoids the complications of revision of a primary total hip arthroplasty. The assessment concluded, therefore, that the benefits comprise initial hip resurfacing results as good as total hip arthroplasty and a simpler revision to total hip arthroplasty when needed. The assessment noted that, although longer-term (i.e., greater than 5 years) data on the relative durability of hip resurfacing compared to total hip arthroplasty are unavailable, current evidence is sufficient to conclude that hip resurfacing is a safe and effective means for initial surgical treatment in younger, properly selected patients who require a THR. The assessment explained that primary use of hip resurfacing in the indicated patient subpopulation thus defers standard total hip arthroplasty.

By contrast, an assessment by the California Technology Assessment Forum (CTAF, 2007) found that metal-on-metal hip resurfacing does not meet CTAF criteria. The CTAF assessment explained that there are no randomized clinical
trials with either of the 2 currently approved devices that address the question of whether hip resurfacing is as safe and efficacious as total hip arthroplasty in comparable patients. The assessment noted that the peer-reviewed literature consists primarily of level 5 case series that report on the experience of a single surgeon operating at a single center with relatively short follow-up. The assessment identified several important questions that remain unanswered about hip resurfacing. These include questions about the long-term durability of hip resurfacing compared to total hip arthroplasty, questions about the short- and long-term results of total hip arthroplasty in persons who have undergone hip resurfacing, and whether there will be unforeseen long term complications that will make this revision more problematic than anticipated. The assessment also questioned what are the long-term health consequences of increased low levels of circulating metal ions produced by hip resurfacing. The assessment questioned whether outcomes of hip resurfacing will be as good as the procedure is disseminated and performed by less experienced surgeons.

In a controlled prospective study, Knecht et al (2004) examined if there are differences in function after resurfacing arthroplasty of the hip in patients with primary osteoarthritis compared to patients with secondary osteoarthritis due to developmental dysplasia of the hip (DDH). Patients with primary osteoarthritis (n = 54, average age of 48.4 years) and osteoarthritis due to high-grade dysplasia (Eftekhar B, n = 34, average age of 55.8 years) were included in this study. Standardized clinical (Harris hip score [HHS]) and radiographical examinations were performed at 6 weeks, 3 months, 6 months, and then every year after the operation. All patients could be followed-up to 1.5 years (1 to 4 years) after surgery. The average HHS improved to 82 to 95 points in both groups 3 months post-operatively. Statistically significant differences could be found in the subscales "function" and "limp", where patients with DDH showed somewhat lower results after 6 (function) to 12 weeks (limp) post-operatively. This is probably attributable to extended non-weight-bearing after acetabular reconstruction in these cases, as the difference disappeared with full weight-bearing. Radiographically determined neck-shaft angles are slightly higher in dysplastic hips (142 degrees versus 135 degrees), but these researchers did not recognize any significant differences in implant positioning. The authors concluded that the short-term to mid-term results showed no clinically relevant functional differences after surface replacement in patients with primary osteoarthritis of the hip and patients with secondary osteoarthritis due to higher grade dysplasia. They stated that long-term observation is needed, however, to determine if these positive functional results are reflected by appropriate radiographical survival.

Amstutz and colleagues (2007) analyzed the mid-term results in a consecutive series of middle-aged patients with DDH treated with hybrid resurfacing joint arthroplasty. Metal-on-metal hip resurfacing was carried out in 51 patients (59 hips), 42 of whom were female. The average age at the time of surgery was 43.7 years. Radiographical and clinical data were collected at 6 weeks, at 3 months, and at yearly follow-up visits. Seven hips had Crowe type II DDH and 52 had type I. The follow-up period ranged from 4.2 to 9.5 years (average of 6.0). Initial stability was achieved in all but 3 hips. The clinical outcomes, as rated with the University of California at Los Angeles (UCLA) hip score, improved significantly compared with the pre-operative ratings. On the average, the pain rating improved from 3.2 to 9.3 points; the score for walking, from 6.0 to 9.7 points; the
score for function, from 5.7 to 9.6 points; and the score for activity, from 4.6 to 7.3 points (all \( p = 0.0001 \)). The mean Short Form-12 (SF-12) mental score increased from 46.6 to 53.5 points, and the mean SF-12 physical score increased from 31.7 to 51.4 points (both \( p < 0.0001 \)). The mean post-operative HHS was 92.5 points. On the average, the range of flexion improved from 106 degrees to 129.6 degrees; the abduction-adduction arc, from 41.9 degrees to 76.9 degrees; and the rotation arc in extension, from 32.1 degrees to 84.8 degrees (all \( p = 0.0001 \)). Four patients delivered a total of 6 healthy babies since the time of implantation of the prosthesis. Radiographical analysis showed a decrease in the mean body weight lever arm from 118.5 mm pre-operatively to 103.9 mm post-operatively (\( p = 0.007 \)). There were 5 femoral failures requiring conversion to a total hip arthroplasty. One hip showed a radiolucency around the metaphyseal femoral stem. There were no complete acetabular radiolucencies, and all sockets remained well-fixed. The authors concluded that the mid-term results of metal-on-metal resurfacing in patients with Crowe type I or II DDH were disappointing with respect to the durability of the femoral component. However, the fixation of the porous-coated acetabular components without adjuvant fixation was excellent despite incomplete lateral acetabular coverage of the socket. They stated that more rigorous patient selection and especially meticulous bone preparation are essential to minimize femoral neck fractures and loosening after this procedure.

Li and associates (2008) reported the findings of 21 consecutive patients (26 hips) with osteoarthritis secondary to DDH who underwent metal-on-metal hip resurfacing. Average age at the time of surgery was 46.5 years (range of 37 to 59 years). Six patients (28.6%) were men and 15 (71.4%) were women. During the same period, another 21 patients (26 hips) with DDH secondary to osteoarthritis were treated with ceramic-on-ceramic total hip arthroplasty (THA). Average patient age at the time of surgery was 48.2 years (range of 38 to 64 years). At follow-up, no complications (e.g., dislocation, infection, or symptomatic deep venous thrombosis) occurred in the 2 groups. No significant difference was noted in HHS between the 2 groups, but the average range of motion (ROM) of the hip resurfacing group was significantly better than the THA group (\( p < 0.05 \)). All patients reported significant pain relief on their operated hips, with the post-operative visual analog scale scores less than 2. No signs of early loosening were observed on radiographs. The authors concluded that the short-term results of the metal-on-metal hip resurfacing have been encouraging in the treatment of DDH, with better range of motion recovery than conventional THA.

Wang et al (2008) examined the clinical results of metal-on-metal hip resurfacing arthroplasty for patients with DDH. A total of 34 cases of DDH (Crowe types I and II) were attempted to have metal-on-metal hip resurfacing arthroplasty. There were 29 females (32 hips), 5 males (5 hips). The average age was 45 years old (range of 26 to 57). Radiographical and clinical evaluations were taken at 6 weeks, 3 months, 1 year and then once-yearly post-operatively. The average HHS was 35 (range of 25 to 44). Hip flexion was 101 degrees, abduction 24 degrees, adduction 15 degrees. Three patients were turned to THA during operations; 31 patients (34 hips) received hip resurfacing surgery. These 31 patients were followed for an average of 21.4 months (range of 12 to 33 months). The average HHS was 94 (range of 82 to 100) at the latest follow-up, and there was statistical difference compared with the pre-operative score (\( p < 0.01 \)). Hip flexion increased to 133 degrees, abduction to 48 degrees, adduction to 26
degrees. No radiolucency line was found at both acetabular and femoral sides in all the patients. The average abduction angle of acetabular cup was 43 degrees (range of 40 to 53), and the average stem shaft angle was 139 degrees (range of 130 to 145). The authors concluded that the short-term result is excellent. They stated that mid-term to long-term results for hip resurfacing arthroplasty in patients with DDH are being awaited.

McBryde et al (2008) performed metal-on-metal hip resurfacing for DDH in 96 hips in 85 patients (78 in women and 18 in men) with a mean age at the time of surgery of 43 years (range of 14 to 65). These cases were matched for age, gender, operating surgeon and date of operation with a group of patients with primary osteoarthritis who had been treated by resurfacing, to provide a control group of 96 hips (93 patients). A clinical and radiological follow-up study was performed. The dysplasia group were followed for a mean of 4.4 years (range of 2.0 to 8.5) and the osteoarthritis group for a mean of 4.5 years (range of 2.2 to 9.4). Of the dysplasia cases, 17 (18 %) were classified as Crowe type III or IV. There were 5 (5.2 %) revisions in the dysplasia group and none in the osteoarthritic patients. Four of the failures were due to acetabular loosening and the other sustained a fracture of the neck of femur. There was a significant difference in survival between the 2 groups (p = 0.02). The 5-year survival was 96.7 % (95 % confidence interval [CI]: 90.0 to 100) for the dysplasia group and 100 % (95 % CI: 100 to 100) for the osteoarthritic group. There was no significant difference in the median Oxford hip score between the 2 groups at any time during the study. The medium-term results of metal-on-metal hip resurfacing in all grades of DDH are encouraging, although they are significantly worse than in a group of matched patients with osteoarthritis treated in the same manner.

Naal and associates (2009) evaluated 24 patients (32 hips; mean age of 44.2 years) after hip resurfacing performed for osteoarthritis secondary to DDH. These investigators used the HHS, the UCLA activity scale, and a sports and activity questionnaire. A radiographical analysis also was performed. They followed patients a minimum of 28 months (mean of 43 months; range of 28 to 60 months). The HHS improved from a mean of 54.7 to 97.3 and UCLA activity levels increased from a mean of 5.3 to 8.6. All patients returned to sports activity at a mean of 11 weeks after surface replacement. There were no major differences in pre-operative and post-operative participation in the most common sports and activities. Two of the 32 replacements (6 %) failed. These researchers detected femoral radiolucencies in 10 of the remaining 30 hips. Despite satisfactory outcomes in clinical scores, return to sports, and hip biomechanics, the failure rate of 6 % was disappointing. The authors concluded that additional follow-up is important to assess if failure rates increase in these young, active patients.

Prosser and colleagues (2010) stated that the outcome of modern resurfacing remains to be determined. The Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) started collection of data on hip resurfacing at a time when modern resurfacing was started in Australia. The rate of resurfacing has been higher in Australia than in many other countries. As a result, the AOANJRR has one of the largest series of resurfacing procedures. This study was undertaken to determine the results of this series and the risk factors associated with revision. Data from the AOANJRR were used to analyze the survivorship of 12,093 primary resurfacing hip replacements reported to the Joint
Replacement Registry between September 1999 and December 2008. This was compared to the results of primary conventional THR reported during the same period. The Kaplan-Meier method and proportional hazards models were used to determine risk factors such as age, sex, femoral component size, primary diagnosis, and implant design. Female patients had a higher revision rate than males; however, after adjusting for head size, the revision rates were similar. Prostheses with head sizes of less than 50 mm had a higher revision rate than those with head sizes of 50 mm or more. At 8 years, the cumulative per cent revision of hip resurfacing was 5.3 (4.6 to 6.2), as compared to 4.0 (3.8 to 4.2) for total hip replacement. However, in osteoarthritis patients aged less than 55 years with head sizes of 50 mm or more, the 7-year cumulative per cent revision for hip resurfacing was 3.0 (2.2 to 4.2). Also, hips with dysplasia and some implant designs had an increased risk of revision. The authors concluded that risk factors for revision of resurfacing were older patients, smaller femoral head size, patients with developmental dysplasia, and certain implant designs.

Hartmann and colleagues (2012) examined if the long-term survival rate of hip resurfacing is comparable to that of conventional THA and certain factors can be identified that influence serum ion concentration 10 years post-operatively. These investigators specifically assessed (i) the 10-year survivorship in the whole cohort and in male and female patients, (ii) serum concentrations of metal ions in patients with hip resurfacing who had not undergone revision surgery, and (iii) potential influencing factors on the serum ion concentration. These researchers retrospectively reviewed their first 95 patients who had 100 hip resurfacings performed from 1998 to 2001. The median age of the patients at surgery was 52 years (range of 28 to 69 years); 49 % were men. They assessed the survival rate (revision for any reason as the end point), radiographical changes, and serum ion concentrations for cobalt, chromium, and molybdenum. The correlations between serum ion concentration and patient-related factors (age, sex, BMI, activity) and implant-related factors (implant size, cup inclination, stem-shaft angle) were investigated. The minimum follow-up was 9.3 years (mean of 10 years; range of 9.3 to 10.5 years). The 10-year survivorship was 88 % for the total cohort. The overall survival rate was greater in men (93 %) than in women (84 %). Median serum ion levels were 1.9 μg/L for chromium, 1.3 μg/L for cobalt, and 1.6 μg/L for molybdenum. Radiolucent lines around acetabular implants were observed in 4 % and femoral neck thinning in 5 %. The authors concluded that although their overall failure rate was greater than anticipated, the relatively low serum ion levels and no revisions for pseudotumors in young male patients up to 10 years post-operatively provide some evidence of the suitability of hip resurfacing in this subgroup.

Vendittoli et al (2013) compared metal-on-metal hip resurfacing with 28-mm diameter metal-on-metal THR. A total of 219 hips in 192 patients aged between 18 and 65 years were randomized to 28-mm metal-on-metal uncemented THRs (107 hips) or hybrid hip resurfacing (HR, 112 hips). At a mean follow-up of 8 years (6.6 to 9.3), there was no significant difference between the THR and HR groups regarding rate of revision (4.0 % (4 of 99) versus 5.8 % (6 of 104), p = 0.569) or re-operation rates without revision (5.1 % (5 of 99) versus 2.9 % (3 of 104), p = 0.428). In the THR group, 1 recurrent dislocation, 2 late deep infections and 1 peri-prosthetic fracture required revision, whereas in the HR group 5 patients underwent revision for femoral head loosening and 1 for adverse reaction to metal
debris. The mean University of California, Los Angeles activity scores were significantly higher in HR (7.5 (S.D. 1.7) versus 6.9 (S.D. 1.7), p = 0.035), but similar mean Western Ontario and McMaster Universities Osteoarthritis Index scores were obtained (5.8 (S.D. 9.5) in HR versus 5.1 (S.D. 8.9) in THR, p = 0.615) at the last follow-up. Osteolysis was found in 30 of 81 THR patients (37.4 %), mostly in the proximal femur, compared with 2 of 83 HR patients (2.4 %) (p < 0.001). At 5 years the mean metal ion levels were less than 2.5 μg/L for cobalt and chromium in both groups; only titanium was significantly higher in the HR group (p = 0.001). The authors concluded that although revision rates and functional scores were similar in both groups at mid-term, long-term survival analysis is needed to determine whether one procedure is more advantageous than the other.

Shoulder Resurfacing:

Shoulder resurfacing is a more conservative approach to conventional total shoulder replacement (TSR) surgery for the treatment of glenohumeral arthritis, humeral head fractures, and osteochondral lesions. It is being explored as an option for shoulder replacement, especially in younger, more active adults. Resurfacing replaces only the damaged or diseased part of the humeral head instead of the entire joint. During shoulder resurfacing, the humeral head is reshaped and replaced with a metal covering, or cap, thus preserving the bone of the proximal part of the humerus. Shoulder resurfacing can be performed with devices that provide complete or partial coverage and can be done alone (hemi-resurfacing) or in combination with glenoid replacement (total shoulder resurfacing). If the glenoid is replaced, a polyethylene glenoid replacement prosthesis or an interposed soft-tissue graft is used. Shoulder resurfacing is potentially less traumatic, less invasive, and preserves more bone. Since the bone stock has been maintained, revision to a conventional TSR can be undertaken, if needed.

Several prosthetic designs are currently available in the United States. The implants are constructed from cobalt-chromium or a titanium-alloy. Some have a ceramic surface coating, while others provide a titanium porous coating on the undersurface where the implant rests against the bone. Examples of brands of shoulder resurfacing include Copeland Extended Articulating Surface (EASTM) Resurfacing Heads, DePuy Global Cap, CTA Resurfacing Shoulder Humeral Head, Axiom Shoulder Resurfacing System, and HemiCAP (also referred to as Contoured Articular Prosthetic (CAP) Humeral Head Resurfacing Prothesis).

The Interlok/HA Copeland Resurfacing Heads (Biomet, Inc., Warsaw, IN) received 510(k) marketing clearance from the U.S. Food and Drug Administration in 2001. These devices are intended for uncemented use and are designed to maintain maximum bone stock by removing minimal bone and replacing only the defective surface. The spherical humeral heads contain a tapered, fluted stem for fixation with an interlok and a hydorxyapatite surface finish to the stem and inside spherical radius.

Levy and Copeland (2001) reported their experience using the Copeland Mark-2 prosthesis (Biomet, Inc., Warsaw, IN) during cementless surface replacement arthroplasty in a case-series study of 103 treated shoulders with a mean follow-up of 6.8 years. The authors reported that 93.9 % of the patients considered their
shoulder to be much better or better than before the operation. Radiological review showed no evidence of radiolucency in 61 of 88 humeral implants (69.3%). Eight shoulders required revision (7.7%), 5 of which were revised to a stemmed humeral component. Mild subluxation of the humeral head was observed in 15 shoulders, moderate superior migration was observed in 7, and severe superior subluxation with obliteration of the acromiohumeral interval was observed in 8.

In another case-series study of the Copeland prosthesis by the same investigators (Levy and Copeland, 2004), 79 cementless surface replacement arthroplasties (total shoulder resurfacing = 42, hemiarthroplasty = 37) were performed for primary osteoarthritis of the shoulder. The mean follow-up was 7.6 years (range of 48 months to 13 years) for total shoulder resurfacing and 4.4 years (range of 24 months to 6.5 years) for hemiarthroplasty. The investigators reported that 89.9% of the patients considered the shoulder to be much better or better as a result of the operation. Radiological review showed 1 humeral implant and 3 glenoid implants had evidence of loosening. Four revisions were performed in the total shoulder resurfacing group. No revision surgery was needed in the hemiarthroplasty group.

A case-series study (52 patients, 56 shoulders) by Thomas et al (2005) of humeral head surface replacement hemiarthroplasty using the Copeland prosthesis for treatment of osteoarthritis (n = 20), rheumatoid arthritis (n = 26), rotator cuff arthropathy (n = 1), and post-traumatic arthrosis (n = 1) with a mean follow-up of 34 months (mean age of 68 years) reported comparable results to Copeland's series.

These small case-series reports with the Copeland prosthesis indicated that most patients experienced improvements in motion, pain, and strength in the short- and mid-term; however, overlap in patients between the same investigators is likely and there are no randomized controlled studies comparing outcomes to traditional shoulder replacement surgery.

Fuerst et al (2007, 2008) evaluated the mid-term results of the DUROM cup (Zimmer, Switzerland) surface replacement in a cohort of 35 patients (42 shoulders) with rheumatoid arthritis affecting the glenohumeral joint. Thirty-five shoulders in 29 patients (average age of 61.4 years) were evaluated prospectively after an average follow-up period of 73 months. The mean Constant score for the 35 shoulders increased from 20.8 points pre-operatively to 64.3 points at a mean of 73.1 months post-operatively. There were 3 revisions: (i) to replace an implant that was too large, (ii) to treat glenoid erosion, and (iii) due to loosening of the implant. Over the 5-year follow-up period, proximal migration of the cup increased in 63% of the shoulders, and the glenoid depth increased in 31%. The authors concluded that these mid-term results of the cemented DUROM cup are very encouraging and that the advantage of cup arthroplasty is the less complex bone-sparing surgery and in the event of failure of the implant, other reliable salvage options remain.

Buchner et al (2008) compared short-term functional results after cementless surface replacement of the humeral head (CUP) with those obtained after TSR for osteoarthritis of the shoulder. A total of 22 patients (average age of 61.4 years) with primary osteoarthritis who obtained surface replacement of the humeral head
were compared to a control group of 22 TSR patients (average age of 61.1 years). Patients in the CUP group showed significantly better peri-operative results (time of surgery, blood loss, days of in-patient treatment) compared to the patients in the TSR group. Both groups showed significant improvement in clinical function and pain reduction and had high subjective satisfaction rates; however, the TSR group showed a statistically significant improvement in mobility, abduction, and range of motion compared to the CUP group at 12 months. Two CUP implants had to be removed during the follow-up period owing to secondary glenoidal erosion. The authors concluded that at short-term follow-up, surface replacement is technically less demanding and provided only slightly inferior results to TSR.

Raiss et al (2010) reported the results from a prospective study of cementless humeral surface replacement arthroplasty in 23 patients (26 implants) less than 55 years of age treated with cementless humeral surface replacement with a mean follow-up of 2.5 years. Ten patients had post-traumatic osteoarthritis, 7 had primary osteoarthritis, and 6 had osteonecrosis. Patients were evaluated using the Constant score, shoulder motion, and subjective satisfaction. The mean Constant score increased significantly from 33 points pre-operatively (8 to 69 points) to 61 points post-operatively (25 to 83 points; \( p < 0.0001 \)), adjusted to age and gender from 38 % (8 to 86 %) to 70 % (28 to 114 %; \( p < 0.0001 \)). Significant improvement for the whole cohort was found regarding patients' pain, activity, mobility, shoulder flexion and abduction, and internal and external rotation \( (p < 0.001) \). In 1 case, re-operation was necessary due to a superficial wound infection, and in another case, implant revision to a TSR was performed because of glenoid erosion. The authors concluded that cementless humeral surface replacement arthroplasty is a viable bone-preserving treatment option for young and active patients and that later conversion to TSR is possible; however, long-term investigations are necessary to confirm these observations.

Biological glenoid resurfacing with or without prosthetic humeral head replacement has been suggested as a means to avoid the potential complications of polyethylene use in younger patients with glenohumeral arthritis. A variety of biologic surfaces, including anterior capsule, autogenous fascia lata, and Achilles tendon allograft, have been used; however, there is little evidence in the peer-reviewed literature that these biological grafts can provide a durable bearing surface over time. Poor clinical outcomes related to persistent post-operative infection have also been reported (Elhassan et al, 2009).

de Beer and colleagues (2010) analyzed the intermediate-term findings of arthroscopic debridement and biological resurfacing of the arthritic glenoid in a middle-aged population using an acellular human dermal scaffold. Between 2003 and 2005, a total of 32 consecutive patients underwent an arthroscopic debridement and biological glenoid resurfacing for glenohumeral arthritis. The diagnoses included primary osteoarthrosis \( (n = 28) \), arthritis after arthroscopic reconstruction for anterior instability \( (n = 1) \) and inflammatory arthritis \( (n = 3) \). All shoulders were assessed clinically using the Constant and Murley score, and results graded according to Neer's criteria. Statistical analysis was performed to determine significant parameters and associations. A significant improvement \( (p < 0.0001) \) in each parameter of the subjective evaluation component (severity of pain, limitation in daily living and recreational activities) of the Constant score was
observed. The Constant and Murley score increased significantly ($p < 0.0001$) from a median of 40 points (range of 26 to 63) pre-operatively to 64.5 (range of 19 to 84) at the final assessment. Overall, the procedure was considered as "successful outcome" in 23 patients (72 %) and as a "failure" in 9 patients (28 %). According to Neer's criteria, the result was categorized as excellent in 9 (28 %), satisfactory in 14 (44 %) and unsatisfactory in 9 (28 %). Within the unsatisfactory group, there were 5 conversions to prosthetic arthroplasty. A standard magnetic resonance imaging was performed on 22 patients in the successful outcome group; glenoid cartilage was identified in 12 (thick in 5, intermediate in 1, thin in 6) and could not be identified in 10 patients (complete/incomplete loss in 5, technical difficulties in 5). Overall, 5 complications included transient axillary nerve paresis, foreign-body reaction to biological material, inter-layer dissociation, mild chronic non-specific synovitis and post-traumatic contusion. Dominance of affected extremity and generalized disease (diabetes, rheumatoid arthritis, generalized osteoarthritis) was associated with an unsatisfactory outcome ($p < 0.05$). The authors concluded that arthroscopic debridement and biological resurfacing of the glenoid is a minimally invasive therapeutic option for pain relief, functional improvement and patient satisfaction in glenohumeral osteoarthritis, in the intermediate-term. Long-term data are needed to ascertain the value of shoulder resurfacing.

Elser et al (2010) discussed surgical decision making and up-to-date summaries of the current techniques available to treat both focal chondral defects and more massive structural osteochondral defects of the shoulder. These techniques include microfracture, osteoarticular transplantation (osteochondral autograft transfer system [OATS]), autologous chondrocyte implantation, bulk allograft reconstruction, as well as biologic resurfacing. The authors stated that as new approaches to glenohumeral cartilage repair and shoulder joint preservation evolve, there continues to be a heightened need for collaborative research and well-designed outcomes analysis to facilitate successful patient care.

While shoulder resurfacing appears to be a promising new procedure for the treatment of glenohumeral arthritis, humeral head fractures, and osteochondral lesions, long-term data from randomized controlled studies are lacking. Further studies to assess the long-term outcomes and to evaluate alternative surface bearing materials, especially on the glenoid side are needed.

Gobezie et al (2011) noted that the treatment of advanced, bipolar glenohumeral osteoarthritis in the young patient is particularly challenging because of the expected failure of a traditional shoulder arthroplasty within the patient's lifetime. These investigators have had early success performing osteochondral allograft resurfacing of the humeral head articular surface and glenoid articular surface, and they described a new all-arthroscopic technique for performing this procedure. In the context of their new procedure, these researchers have reviewed the available literature on the topic of biologic resurfacing with osteochondral allograft and have provided an overview of the relevant findings. Although only short-term follow-up data are available, their results in young patients have been promising in terms of regained motion, minimal pain, and accelerated rehabilitation. The authors believed that this new arthroscopic biologic shoulder resurfacing technique has the potential to be superior to other available treatments for this patient population because it preserves bone stock, limits
damage to surrounding structures, and allows for early rehabilitation. They stated that although longer-term follow-up is needed, early results have been greatly encouraging.

Longo et al (2011) stated that young patients with degenerative shoulder disease are a therapeutic challenge. To try to delay a shoulder arthroplasty, biological interpositional arthroplasty has been proposed to provide a biologically active bearing surface that could eventually result in the formation of fibrocartilage, fibrous tissue, or hyaline cartilage. Anterior capsule, autogenous fascia lata, Achilles tendon allograft, lateral meniscus allograft, human dermis, and porcine small intestine submucosa have been used as interposition material, either alone or in combination with a hemiarthroplasty or humeral resurfacing procedure. Some investigators have reported favorable long-term results, although others have found this procedure unreliable. Several variables are unknown at present, such as the best biological resurfacing device, healing potential, possible antigenic responses, optimal fixation technique or position, aftercare restrictions. The authors concluded that further prospective studies with long follow-up are necessary to provide data that will help to define the role of biological glenoid resurfacing in young patients with glenohumeral arthritis.

Lee and colleagues (2013) noted that there is a lack of consensus in treating glenohumeral arthritis in younger patients. Hemi-arthroplasty has historically been favored because of complications associated with total shoulder arthroplasty. Biologic resurfacing of the glenoid has been investigated as a potential treatment that would decrease glenoid erosion and pain, the major complications of hemiarthroplasty. These investigators reported on 19 shoulders treated with meniscal allograft glenoid resurfacing and shoulder hemi-arthroplasty. All patients were followed-up for a minimum of 2 years post-operatively (mean of 4.25 years) with Disabilities of the Arm, Shoulder and Hand (DASH), Simple Shoulder Test (SST), and visual analog scale (VAS) scores. In addition, these researchers compared the outcomes related to pre-operative concentric versus eccentric glenoid wear. At final follow-up, the mean score for the DASH questionnaire was 28; SST, 8; and VAS, 3.5. Whereas the eccentric wear group (DASH score, 19.4; SST score, 9.1; VAS score, 2.5) exhibited better shoulder function and pain scores compared with the concentric wear group (DASH score, 37.6; SST score, 8.4; VAS score, 4.1), the difference was not statistically significant (p = 0.098, p = 0.647, and p = 0.198, respectively). There were 6 complications (32 %), all resulting in repeat surgery. Three patients underwent total shoulder arthroplasty and 1 shoulder had revision hemi-arthroplasty, whereas synovectomy was performed in another shoulder. The 6th patient underwent lysis of adhesions and capsular release. The authors concluded that with long-term follow-up, they have observed that biologic resurfacing of the glenoid with meniscal allograft exhibited inconsistent results and high complication rates. They stated that strong consideration should be given to performing total shoulder arthroplasty in patients in whom all conservative treatment options have failed.

Merolla and associates (2013) reported clinical and radiographic mid-term outcomes in a population of 60 patients, aged 50 years or younger, who underwent shoulder resurfacing in osteoarthritis. The mean age was 48 ± 8.4 years, 36 were male and 24 female, dominant arm in 43 cases. Glenoid arthritis was treated in 36 cases (60 %) using a meniscus allograft in 22 cases, biologic
patch in 4 cases and microfractures in 10 cases. Clinical and radiographic assessment was performed with Constant-Murley score and standard X-ray. At an average follow-up of 44 months, the mean values of the constant score increased 30 points (p < 0.05), the pain decreased of 4.56 points (p < 0.05) and the Simple Shoulder Test increased 4.3 points (p < 0.05). These researchers found lower scores (p > 0.05) in 9 patients (15 %) treated for glenoid arthritis using homologous meniscus (7 cases) and biologic patch (2 cases). A significant narrowing of joint space (5.92 mm post-operative versus 1.65 mm at 37 months) (p < 0.05) was found in the 22 cases treated with meniscus interposition. In 4 cases with type A2 pre-operative glenoid morphology and in 9 cases type B1; these investigators registered significantly lower scores compared with the overall study population (p < 0.01). There were 5 unsatisfied patients (7 %) – they underwent meniscus removal and glenoid reaming in 3 cases, and conversion in total shoulder arthroplasty in 2 cases. The authors concluded that resurfacing arthroplasty is an effective device in young patients with advanced glenohumeral arthropathy; however, the high rate of post-operative glenoid erosion and the failure of biologic allograft lead them to consider glenoid replacement as the best option to improve clinical outcomes.

Knee/Partial Knee/Patellar Resurfacing

The Work Loss Data Institute's guideline on “Knee & leg (acute & chronic)” (2013) listed focal joint resurfacing (Arthrosurface HemiCAP™/UniCAP™) as one of the interventions that were considered, but not recommended.

Dhollander et al (2014) described the clinical and radiographical outcome of the HemiCAP® resurfacing system as a salvage treatment for a failed index cartilage procedure. A total of 14 patients were treated consecutively and clinically prospectively followed for a mean period of 26.1 ± 12.8 months. All patients were previously treated for their cartilage lesion. Radiographical data were analyzed based on the Kellgren and Lawrence system. The patients involved in this study demonstrated a gradual clinical improvement in time. However, radiographically significant osteoarthritic changes were observed during the follow-up period. The position of the HemiCAP® resurfacing system was adequate in all cases, and no signs of loosening were observed during the follow-up period. The authors concluded that the HemiCAP® resurfacing system is feasible as a salvage treatment for a failed index cartilage procedure and resulted in a gradual clinical improvement. However, the favorable clinical outcome was not confirmed by the radiographical findings.

Chen et al (2013) stated that patella resurfacing or non-resurfacing in total knee arthroplasty (TKA) remains controversial. These investigators evaluated the effectiveness of patellar resurfacing through an evaluation of the current literature. They performed a meta-analysis of randomized controlled trials (RCTs) comparing TKA performed with and without patellar resurfacing. Outcomes of re-operation, anterior knee pain and knee scores were analyzed. A total of 14 trials assessing 1,725 knees were eligible. The absolute risk of re-operation was reduced by 4 % (95 % CI: 2 to 6 %) in the patellar resurfacing arm (between-study heterogeneity, p = 0.05, I(2) = 42 %), implying that one would have to resurface 25 patellae (95 % CI: 17 to 50 patellae) in order to prevent one re-operation. There was no difference between the 2 groups in terms of anterior knee pain, knee pain score,
knee society score (KSS) and knee function score (KFS). But in the studies followed up for a mean time of not less than 5 years, a difference was found between the 2 arms in KSS (RR = 2.14, 95 % CI: 0.76 to 3.52; p = 0.002). The authors concluded that the available evidence indicated that patellar resurfacing reduces the risk of re-operation after TKA. Patellar resurfacing patients may make a difference in long-term follow-up (5 or more years) of KSS. In other aspects, the benefit of patellar resurfacing is limited. They stated that more carefully and scientifically designed RCTs are needed to further prove the claim.

Roberts et al (2014) reported that 350 knees were evaluated in a prospective, randomized, double-blinded study of selective patellar resurfacing in primary TKA. Knees with exposed bone on the patellar articular surface were excluded. A total of 327 knees were evaluated at a mean follow-up of 7.8 years; 114 knees followed for greater than 10 years were analyzed separately. Satisfaction was higher in patients with a resurfaced patella. In patients followed for at least 10 years, no significant difference was found. No difference was found in KSS or survivorship. No complications of patellar resurfacing were identified. The authors concluded that the vast majority of patients with remaining patellar articular cartilage did very well with TKA regardless of patellar resurfacing. Patient satisfaction may be slightly higher with patellar resurfacing.

Lee et al (2014) evaluated if patellar thickness is related to clinical outcome in the absence of patellar fracture or implant loosening. Early results of 169 patients who underwent TKA with patellar resurfacing were reviewed to assess the effect of patellar thickness on clinical outcome. The mean follow-up was 13 months. The range of motion, KSS, KFS and Western Ontario and McMaster Universities Arthritis Index (WOMAC) Score were assessed pre-operatively, at day 0, 6 months and 1 year. Radiographs were assessed for patellar fracture or implant loosening. Thirty-one percent of all patients had pre-operative thickness less than 21 mm; 7 % had less than 12 mm residual thickness after patellar cut, all were female; 23 % had greater than or equal to 1 mm increase of thickness after surgery. Radiographs did not show any patellar fracture or implant loosening. However, pre-operative patellar thickness less than 21 mm had poorer gain in ROM at 1 year. Pre-operative ROM had greater influence on post-operative ROM than pre-operative patellar thickness. Residual thickness less than 12 mm had lower gain in WOMAC score at 1 year and an increase in thickness greater than or equal to 1 mm post-operatively was associated with lower gain in WOMAC score at 6 months. The authors concluded that early results of patellar resurfacing with pre-operative thickness less than 21 mm or residual thickness less than 12 mm were found to be inferior even in the absence of patellar fracture or implant loosening. Furthermore, conservative cutting resulting in 1 mm increase in thickness was also found to have inferior clinical results.

Also, an UpToDate review on “Total knee arthroplasty” (Martin et al, 2014) states that “Patella resurfacing, typically with a polyethylene button, remains a controversial topic in total knee arthroplasty. The primary reason to resurface the patella is the belief that it lessens anterior knee pain and therefore reduces the need for a second operation to resurface the patella. This may be offset by advantages of not resurfacing, which include preservation of bone stock and reduction of patellofemoral complications such as fractures and loosening”.

Makoplasty partial knee resurfacing is used for knee osteoarthritis that affects only 1 or 2 components of the knee. However, there is insufficient evidence that Makoplasty improves health outcomes in patients undergoing knee surgery.

In a pilot study, Lonner et al (2010) compared the post-operative radiographical alignment of the tibial component with the pre-operatively planned position in 31 knees in 31 consecutive patients undergoing unicompartmental knee arthroplasty (UKA) using robotic arm-assisted bone preparation and in 27 consecutive patients who underwent unilateral UKA using conventional manual instrumentation to determine the error of bone preparation and variance with each technique. Radiographically, the root mean square error of the posterior tibial slope was 3.1 degrees when using manual techniques compared with 1.9 degrees when using robotic arm assistance for bone preparation. In addition, the variance using manual instruments was 2.6 times greater than the robotically guided procedures. In the coronal plane, the average error was 2.7 degrees +/- 2.1 degrees more varus of the tibial component relative to the mechanical axis of the tibia using manual instruments compared with 0.2 degrees +/- 1.8 degrees with robotic technology, and the varus/valgus root mean square error was 3.4 degrees manually compared with 1.8 degrees robotically. The authors concluded that further study is needed to examine if a reduction in alignment errors of these magnitudes will ultimately influence implant function or survival.

Werner et al (2014) stated that in comparison with standard surgical techniques robotic-assisted surgery has the advantages of increased surgical accuracy, reproducibility, optimization of component position, and improved patient outcomes in UKA and THA procedures. The MAKO Tactile Guidance System (TGS; MAKO Surgical Corp, Fort Lauderdale, FL) facilitates robotic-assisted arthroplasty procedures currently implemented in many operating rooms. The benefits of this technology are evident, but have not been shown to improve patient outcomes and justify the added financial burden imposed. The authors concluded that further research is needed to determine if this technological advancement will translate into improvements in longevity and clinical outcomes.

Hansen et al (2014) performed a retrospective review in a matched group of patients on the use of robotic-assisted UKA implantation versus UKA performed using standard operative techniques to assess differences between procedures. While both techniques resulted in reproducible and excellent outcomes with low complication rates, the results demonstrate little to no clinical or radiographic difference in outcomes between cohorts. Average operative time differed significantly with, and average of 20 minutes greater in, the robotic-assisted UKA group (p = 0.010). The minimal clinical and radiographic differences lend to the argument that it is difficult to justify the routine use of expensive robotic techniques for standard medial UKA surgery, especially in a well-trained, high-volume surgeon. The authors concluded that further surgical, clinical and economical study of this technology is needed.

Appendix

Contraindications for metal-on-metal hip resurfacing:
Females of child-bearing age because of unknown effect of metal ion release on the fetus
Individuals who are immunosuppressed with diseases such as AIDS or individuals receiving high doses of corticosteroids
Individuals who are severely over-weight
Individuals who are skeletally immature
Individuals with any vascular insufficiency, muscular atrophy, or neuromuscular disease severe enough to compromise implant stability or post-operative recovery
Individuals with bone stock inadequate to support the device
Individuals with infection or sepsis
Individuals with known moderate-to-severe renal insufficiency
Individuals with known or suspected metal sensitivity.

CPT Codes / HCPCS Codes / ICD-9 Codes

**Hip Resurfacing:**

No specific code

**CPT codes covered if selection criteria are met:**

27125

27130

**Other CPT codes related to the CPB:**

27033

27122

27132

27360

**HCPCS codes covered if selection criteria are met:**

S2118 Metal-on-metal total hip resurfacing, including acetabular and femoral components

**ICD-9 codes covered if selection criteria are met:**

715.15 Osteoarthrosis, localized, primary, pelvic region and thigh

715.25 Osteoarthrosis, localized, secondary, pelvic region and thigh

715.35 Osteoarthrosis, localized, not specified whether primary or secondary, pelvic region and thigh

715.95 Osteoarthrosis, unspecified whether generalized or localized, pelvic region and thigh
733.42  Aseptic necrosis of head and neck of femur

**ICD-9 codes not covered for indications listed in the CPB (not all-inclusive):**

754.30 - Congenital dislocation of hip [developmental dysplasia]
754.35

**ICD-9 codes contraindicated for this CPB:**

035  Erysipelas
278.01  Morbid obesity
279.00 - Disorders involving the immune mechanism
279.9
358.0 - 358.9  Myoneural disorders
443.9  Peripheral vascular disease, unspecified
459.81 - Other specified disorders of circulatory system
459.89
584.5 - 584.9  Acute renal failure
585.1 - 585.9  Chronic kidney disease [CKD]
593.9  Unspecified disorder of kidney and ureter [acute renal insufficiency]
711.05  Pyogenic arthritis, pelvic region and thigh
711.45  Arthropathy associated with other bacterial diseases, pelvic region and thigh
711.55  Arthropathy associated with other viral diseases, pelvic region and thigh
711.65  Arthropathy associated with mycoses, pelvic region and thigh
711.75  Arthropathy associated with helminthiasis, pelvic region and thigh
711.85  Arthropathy associated with other infectious and parasitic diseases, pelvic region and thigh
711.95  Unspecified infective arthritis, pelvic region and thigh
728.2  Muscular wasting and disuse atrophy, not elsewhere classified
995.90 - Systemic inflammatory response syndrome (SIRS)
995.94
V58.65  Long-term (current) use of steroids
V85.41 - Body Mass Index 40.0 and over [for over 40.0 only]
V85.45

Shoulder Resurfacing:

There are no specific codes for shoulder resurfacing:

CPT codes not covered for indication listed in the CPB (not all-inclusive):

23470
23472

ICD-9 codes not covered for indications listed in CPB (not all-inclusive):

715.11 Osteoarthrosis, localized, primary, shoulder region
715.21 Osteoarthrosis, localized, secondary, shoulder region
715.31 Osteoarthrosis, localized, not specified whether primary or secondary, shoulder region
715.91 Osteoarthrosis, unspecified whether generalized or localized, shoulder region
716.11 Traumatic arthropathy, shoulder region
716.51 Unspecified polyarthropathy or polyarthritis, shoulder region
716.61 Unspecified monoarthritis, shoulder region
716.81 Other specified arthropathy, shoulder region
716.91 Arthropathy unspecified, shoulder region
732.7 Unspecified infective arthritis, shoulder region
812.00 - Fractures of humerus [humeral head]
812.19

The above policy is based on the following references:

Hip Resurfacing:


40. BlueCross BlueShield Association (BCBSA), Technology Evaluation Center (TEC). Metal-on-metal total hip resurfacing. TEC Assessment Program. Chicago, IL: BCBSA; June 2007;22(3).
53. Garbuz DS, Tanzer M, Greidanus NV, et al. The John Charnley Award: Metal-on-metal hip resurfacing versus large-diameter head metal-on-metal


Shoulder Resurfacing:


Knee/Patellar Resurfacing


