

# Vitallium® Cup Arthroplasty: Case Report of a 57-Year Follow-Up

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**D**uring the first half of the 20th century, interpositional/mold-cup arthroplasty of the femoral head was a popular form of treatment for afflictions of the hip joint. However, the technique lost favor after the introduction of total hip arthroplasty (THA). Interestingly, the concept of hemiresurfacing of the femoral head has gained momentum recently as a response to the lower success rate of THA for young persons with osteonecrosis. Here we report the case of a 57-year follow-up on a Vitallium® cup arthroplasty performed to treat the resultant deformity of Legg-Calvé-Perthes disease. This case represents a unique opportunity to view the results of a procedure that was one of the progenitors of modern hemiresurfacing arthroplasty.

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## CASE REPORT

A 75-year-old white woman presented with the primary complaints of bilateral shoulder pain and decreased motion. During the course of the interview, she revealed that she had undergone an operation on the left hip at the age of 18, in 1942. The operation had been performed to treat a deformity resulting from Legg-Calvé-Perthes (LCP) disease. The patient was 11 years old at the time of diagnosis. She recalled being treated with a spica cast, followed by a long period of bracing.

Radiographs of the left hip revealed a well-seated Vitallium® cup arthroplasty (Figure) with reactive bone

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formation at the lesser trochanter and subchondral sclerosis of the acetabulum.

The patient denied having hip pain. The only hip pain she recalled had been temporary, nondebilitating, and occurred when her children were young. In her youth, she participated in activities such as basketball, roller-skating, and dancing. At 75 years of age, she was still active as a community ambulator (2-3 blocks) without use of a cane or walker. She was able to ascend and descend stairs and did not require any assistance in dressing. She could sit for long periods and use public transportation. Her only



**Figure.** (A) Anteroposterior roentgenogram of the pelvis. (B) Lateral roentgenogram shows positioning of the Vitallium cup arthroplasty 57 years after its implantation.

complaint was the limp, which resulted from a limb-length discrepancy. At 12 years of age, she had a shortening osteotomy of the right femur, but the limb-length discrepancy still affected her gait. She had never dislocated the hip, and no additional operations had been performed.

Examination revealed a 5-cm leg-length discrepancy with no flexion contracture. She could flex the left hip to 60°, abduct to 30°, adduct to 15°, externally rotate to 30°, and internally rotate to 15°. The patient's Harris Hip Score<sup>1</sup> was 78.

## DISCUSSION

In 1923, Smith-Petersen<sup>2</sup> performed a hip arthroplasty using a glass mold, which broke in vivo. Search for a more robust material then ensued, with each material having its own unique problem.<sup>3</sup>

The first Vitallium cup arthroplasty was performed in 1938 by Hopkins and Zuck.<sup>4,5</sup> Smith-Petersen<sup>6</sup> soon adopted the procedure as well.

In 1953, Adams<sup>7</sup> reported success with his method of cup arthroplasty, concentric arthroplasty. According to Waring and Anderson,<sup>8</sup> Adams thought the Smith-Petersen mold had poor results because of mechanical imperfections in the created joint.

In 1949, Stinchfield and Carroll<sup>9</sup> studied 38 patients with 45 cup arthroplasties. Outcomes were dependent on whether the disease was unilateral or bilateral and whether the arthroplasty was unilateral or bilateral. Good to excellent outcomes ranged from 44% to 70%.

Bickel<sup>10</sup> reported on 88 patients with 98 cup arthroplasties performed between 1939 and 1945. In the largest series published, Aufranc<sup>11</sup> reported on 1000 consecutive cases of cup arthroplasty. Overall, there were 220 good to excellent, 600 satisfactory, and 180 poor results. As with other studies,<sup>9,12</sup> even patients with an unsatisfactory result felt that the operation was worthwhile.

In 1959, when surgical principles and postoperative management were more refined, Aufranc and Sweet<sup>13</sup> reported on another 171 patients, concluding that relief of disabling pain could be expected in 85% of patients, with complete relief in 27%. Later studies<sup>14,15</sup> also showed fairly high satisfaction rates with cup arthroplasty.

There are limited data on cup arthroplasty outcomes for patients with LCP disease.<sup>12,16</sup> Bickel and Babb<sup>12</sup> opined that the deformity secondary to LCP disease was the most difficult to treat with cup arthroplasty.

With the popularization of total hip arthroplasty (THA) by Charnley,<sup>17</sup> cup arthroplasty became a procedure of historical interest.<sup>18</sup> However, THA results in young patients with osteonecrosis were not as favorable as anticipated.<sup>19-24</sup> As a result, there is now renewed interest in the concept of hemiresurfacing arthroplasty, particularly for young patients with femoral head osteonecrosis.<sup>25-29</sup>

## CONCLUSIONS

For several decades, cup arthroplasty was a popular procedure for the treatment of pain, loss of motion, loss of

stability, and deformity secondary to disease processes of the hip.<sup>9-16</sup> The results of the operation varied considerably; however, the majority of patients derived significant reduction in pain and improved quality of life.

With hemiresurfacing techniques again becoming part of the orthopedic armamentarium, it is important that we review and understand the history of this operation. This case report represents a rare opportunity to review the clinical and radiographic outcomes of an operation that predates our current hemiresurfacing technology.

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## REFERENCES

- Harris WH. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by mold arthroplasty. An end result study using a new method of result evaluation. *J Bone Joint Surg Am.* 1969;51:737-755.
- Smith-Petersen MN. Joint ankylosis. Surgical measures for its prevention and relief. In: Transactions of the Interstate Post-Graduate Medical Assembly of North America; October 12-16, 1925; St. Paul, Minn.
- Evarts CM, Kendrick JI. Cup arthroplasty. *Orthop Clin North Am.* 1971;2:93-111.
- Hopkins HH, Zuck FN. Arthroplasty of the hip, with use of Vitallium cup. *Med Bull Vet Admin.* 1939;15:1-2.
- Hopkins HH, Zuck FN. Arthroplasty of the hip with use of Vitallium cup (supplemental report). *Med Bull Vet Admin.* 1939;15:217.
- Smith-Petersen MN. Arthroplasty of the hip: a new method. *J Bone Joint Surg.* 1939;21:269-288.
- Adams JC. A reconsideration of cup arthroplasty of the hip. With a precise method of concentric arthroplasty. *J Bone Joint Surg Br.* 1953;35:199-208.
- Waring TL, Anderson LD. Crawford Adams cup arthroplasty. A review of fifty cases. *J Bone Joint Surg Am.* 1961;43:431-442.
- Stinchfield FE, Carroll RE. Vitallium-cup arthroplasty of the hip joint. An end-result study. *J Bone Joint Surg Am.* 1949;31:628-638.
- Bickel WH. Osteo-arthritis of the hip joint with special reference to treatment by cup arthroplasty. *Am J Surg.* 1950;79:420-426.
- Aufranc OE. Constructive hip surgery with the Vitallium mold. A report of 1,000 cases of arthroplasty of the hip over a fifteen-year period. *J Bone Joint Surg Am.* 1957;39:237-248.
- Bickel WH, Babb FS. Cup arthroplasty of the hip. *J Bone Joint Surg Am.* 1948;30:647-656.
- Aufranc OE, Sweet EB. Study of patients with hip arthroplasty at Massachusetts's general hospital. *JAMA.* 1959;170:507-515.
- Johnston RC, Larson CB. Results of treatment of hip disorders with cup arthroplasty. *J Bone Joint Surg Am.* 1969;51:1461-1479.
- Law WA. Late results in Vitallium-mold arthroplasty of the hip. *J Bone Joint Surg Am.* 1962;44:1497-1516.
- Lang AG, Klassen RA. Cup arthroplasties in teen-agers and children. *J Bone Joint Surg Am.* 1957;59:444-450.
- Charnley J. Total hip replacement by low-friction arthroplasty. *Clin Orthop.* 1970;72:7-21.
- Collis DK, Johnston RC. Comparative evaluation of the results of cup arthroplasty and total hip replacement. *Clin Orthop.* 1972;86:102-114.

19. Chandler HP, Reineck FT, Wixson RL, McCarthy JC. Total hip replacement in patients younger than thirty years old: a five-year follow-up study. *J Bone Joint Surg Am.* 1981;63:1426-1434.
20. Salvati EA, Cornell CN. Long-term follow-up of total hip replacement in patients with avascular necrosis. *Instr Course Lect.* 1988;37:67-73.
21. Kantor SG, Huo MH, Huk OL, Salvati EA. Cemented total hip arthroplasty in patients with osteonecrosis: a 6-year minimum follow-up study of second generation cement techniques. *J Arthroplasty.* 1996;11:267-271.
22. Stulberg BN, Singer R, Goldner J, Stulberg J. Uncemented total hip arthroplasty in osteonecrosis: a 2-to-10-year evaluation. *Clin Orthop.* 1997;334:116-123.
23. Ortiguera CJ, Pulliam IT, Cabanela ME. Total hip arthroplasty for osteonecrosis: matched-pair analysis of 188 hips with long-term follow-up. *J Arthroplasty.* 1999;14:21-28.
24. Piston RW, Engh CA, DeCarvalho PI, Suthers K. Osteonecrosis of the femoral head treated with total hip arthroplasty without cement. *J Bone Joint Surg Am.* 1994;76:202-214.
25. De Meulemeester FR, Rozing PM. Uncemented surface replacement for osteonecrosis of the femoral head. *Acta Orthop Scand.* 1989;60:425-429.
26. Nelson CL, Walz BH, Gruenwald JM. Resurfacing of only the femoral head for osteonecrosis: long-term follow-up study. *J Arthroplasty.* 1997;12:736-740.
27. Scott RD, Urse JS, Schmidt R, Bierbaum BE. Use of TARA hemiarthroplasty in advanced osteonecrosis. *J Arthroplasty.* 1987;2:225-232.
28. Amstutz HC, Grigoris P, Safran MR, Grecula MJ, Campbell PA, Schmalzried TP. Precision-fit surface hemiarthroplasty for femoral head osteonecrosis: long-term results. *J Bone Joint Surg Br.* 1994;76:423-427.
29. Hungerford MW, Mont MA, Scott R, Fiore C, Hungerford DS, Krackow KA. Surface replacement hemiarthroplasty for the treatment of osteonecrosis of the femoral head. *J Bone Joint Surg Am.* 1998;80:1656-1664.