

Case Report

The Results of Surgical Management of Bone Metastasis Involving the Periacetabular Area: Siriraj Experience

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Background: Periacetabular metastasis is a common site of bone metastasis and can cause major disability to the patients. Non-operative treatment including medication or radiation therapy is the first treatment modality. The operative treatment is indicated in patients with failed non-operative treatment or pathologic fracture.

Objective: To assess the functional results, quality of life, and complications after reconstruction of the periacetabular metastasis.

Material and Method: Fourteen patients underwent 16 intralesional excisions of tumor and cemented total hip arthroplasty reconstruction from 2002 to 2006. The primary tumors were breast carcinoma in five patients, thyroid carcinoma in three, kidney carcinoma in two, and one each of cervix carcinoma, urinary bladder carcinoma, lung carcinoma, and multiple myeloma. Type of periacetabular metastases by Harrington's classification, age of patients, blood loss, unit of blood transfusion, and postoperative complication were reviewed. Pre- and Postoperative pain by the visual analogue scale was evaluated.

Results: The mean age of patients was 56 years with a mean follow up time of 389 days (range 30-1,275 days). The mean time from diagnosis of primary tumor to periacetabular metastatic surgery was 32.5 months (range 0-84 months). By Harrington's classification, seven patients were classified in class I, four patients were class II, and three patients were class III. The visual analogue scale was improved from more than 8/10 pre-operatively to 2/10 postoperatively. All patients could ambulate and walk independently and two patients could walk without gait support. Four patients died of disease progression and 10 patients are still alive. Two patients had complications from postoperative hip dislocation and acetabular loosening which successfully treated by closed reduction and revision of the prosthesis respectively.

Conclusion: With promising results, low rate of complication and improvement of quality of life could be achieved after total hip arthroplasty reconstruction in the appropriately selected patient with a periacetabular metastasis. Additional surgery may be required in the patient with longer survival or progression of the disease.

Keywords: Periacetabulum, Bone metastasis, Surgery

J Med Assoc Thai 2007; 90 (5): 1006-13

Full text. e-Journal: <http://www.medassocthai.org/journal>

Metastatic carcinoma is the most frequent malignant lesion of bone, and the skeleton represents the third most common site of metastatic spread after the lung and liver. Metastatic lesions are most commonly seen in axial skeleton (spine, pelvis, ribs, and skull) and, when the appendicular skeleton is involved, the

lesions most frequently occur in the proximal long bones^(1,2). Periacetabular metastatic disease is a cause of major disability to the patients, and may lead to loss of ambulatory function and quality of life unless the construct of the iliofemoral weight-bearing axis is restored for force-transmitting in this area.

Non-operative treatment is the first treatment modality that includes restriction of weight bearing, use of bisphosphonate, appropriate adjuvant chemotherapy, and radiation therapy. Surgical intervention

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has to be considered in selected patients with progressive osteolysis from metastatic destruction in this particular area, despite the use of adjuvant treatments. The main goals of surgical intervention are pain relief, restoration, maintenance of function, and life quality. Numerous technological advances have simplified the surgery of periacetabular metastases⁽³⁻⁸⁾. The authors report the results and surgical management of patients with periacetabular metastases.

Material and Method

Between August 2002 and May 2006, 16 acetabular reconstructions were performed in 14 patients. Two patients underwent two operative procedures. The inclusion criteria was patients with metastatic periacetabular disease that was unresponsive to systemic chemotherapy or radiation therapy, adequate physical status for major operation and life expectancy period more than 4-6 weeks.

Prior to the operation, all patients had a complete history, physical examination, plain radiographs of chest, pelvis, hip, and femur. The entire bone was evaluated by a technetium^{99m} bone scintigraphy. Blood testing for evaluation of general condition (complete blood count, electrolyte analysis, coagulation study, and liver function test) was done. A complete pre-operative evaluation of patients was performed that included age, primary malignancy, a visual analogue pain score, and Harrington's classification of periacetabular metastatic

lesion⁽⁴⁾. Hypervascularized tumors that included thyroid, kidney, and urinary bladder carcinoma underwent embolization pre-operatively (Fig. 1). The operative procedure was intralesional excision of tumor and cemented total hip arthroplasty reconstruction. The type of reconstruction depended on Harrington's classification. With Harrington's class I and class II, the reconstruction was conventional cemented total hip arthroplasty with or without an anteprotusion acetabular ring (Fig. 2). In class III, internal fixation was used for reconstruction that included plate, screws, and Steinmann pin fixation (Fig. 3).

The amount of blood loss, the number of units of blood transfusion, the postoperative complications, the visual analogue pain score 4 weeks after the operation, and the ambulatory status was reviewed. All of the patients were postoperatively treated with a radiation therapy dose of 3,000 cGy and appropriate systemic adjuvant therapy. The mean and range were used to present patients' characteristics and the results of the operation.

Results

The mean age of patients at diagnosis was 56 years (range 38-74 years). The mean time from diagnosis of primary malignancy to periacetabular metastatic disease was 32.5 months (range 0-84 months). The mean follow up time was 389 days (range 30-1,275 days). All of the debilitated patients suffered from the

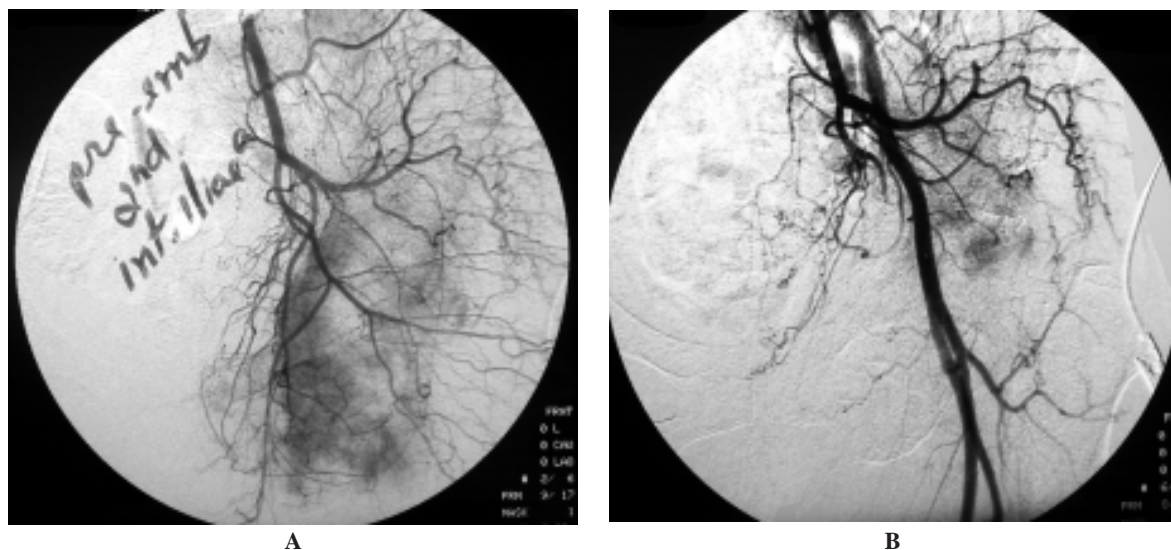


Fig. 1 Angiography of pre-embolization (A) and post-embolization (B)

The post-embolization angiography demonstrated significant reduction of vascularity of the periacetabular tumor

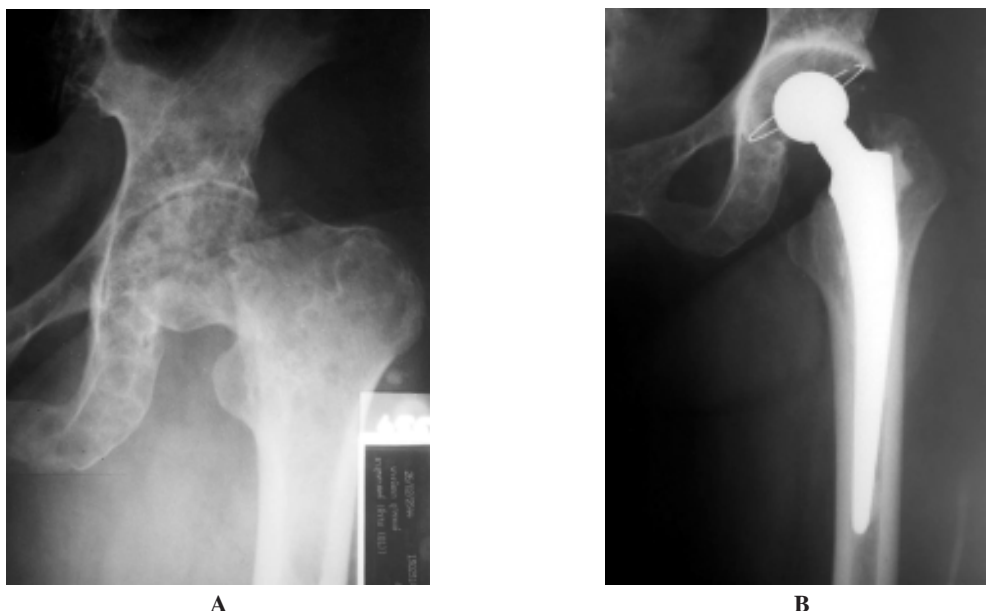


Fig. 2 Radiograph of a patient that was classified in class I (Harrington's classification) (A)
The patient was operated by intraslesional tumor excision and classical cemented total hip arthroplasty reconstruction (B)

disease so severely that they could not ambulate. By Harrington's classification, seven patients were in class I, four patients in class II, three patients in class III, and none was grouped in class IV. The mean operative time was 2.3 hours (range 1.5-3.4 hours). The mean estimated blood loss was 1,614 ml (range 300-5,500 ml). The mean blood transfusion was 3 units (range 0-7 units). The patients' data is demonstrated in Table 1.

Pre-operative pain scores in all patients were more than 8/10 and the mean postoperative pain score was 2/10 at the operative site. Four patients died from progression of the metastatic disease with a mean survival of 105.5 days after the operation. The ambulatory status was improved from bed-ridden to ambulation with walker in six patients; axillary crutches in one patient, cane in five patients, and two patients could walk without gait support.

None of the patients suffered surgical-related death in the present series. There was no neurovascular injury, deep infection, or wound problem following the operation at the time of the follow-up. There were three postoperative complications in two patients. The first was patient number 8, he had postoperative hip dislocation four days after surgery during bedside ambulation. He underwent closed reduction and skin traction for three weeks. At that time, he could walk

with a cane support. Fifteen months after the operation, he developed hip pain from the acetabular loosening. A second operation was performed by an acetabular reconstruction augmented with screw-plate and Steinmann pins. At the last follow-up, he could walk without pain by using a cane for support. The second complication was acetabular loosening from tumor recurrence in patient number 11. He could walk independently without gait support after the first operation. He developed progressive pain at the hip 11 months postoperatively and could not move his hip or ambulate. A second operation was performed by intraslesional tumor excision and reconstructed with a cemented acetabular reconstruction using a flanged anteprostusio cup. Postoperatively, he could walk without pain by using axillary crutches.

Discussion

The presence of bone metastases is indicative for disseminated cancer disease and indicates a short-term survival prognosis in these cancer patients. The primary goal of treatment is palliation of symptoms, with a multidisciplinary team approach. Bone is the third most common site of cancer metastasis, behind the lung and liver⁽²⁾. Bone metastasis can impair the quality of life of patients, due to pain, fracture,



Fig. 3 Radiograph of a patient that was classified in class III (Harrington's classification)
 Plain radiograph and magnetic resonance imaging in the coronal plane demonstrated massive destruction of the lateral, medial, and superior portions of the acetabulum (A, B)
 The patient was treated by intralesional tumor excision and cemented total hip arthroplasty reconstruction with plate-screws, and Steinmann pinfixation (C, D)

spinal cord compression, hypercalcemia, and impaired ambulatory function. Almost 80% of patients with advanced cancer of the prostate or breast will develop bone metastases during their life. More than 80% of bone metastases are located in the axial skeleton, with the vertebrae, ribs, and pelvis the most frequently involved locations^(1,2,9).

Patients with massive acetabular destruction secondary to metastatic cancer suffer from severe pain, difficulty to ambulate, and pathologic fracture. The initial treatment is appropriate systemic chemotherapy and radiation therapy. Patients unresponsive to these

treatment modalities, with a reasonably long life expectancy and no contra-indication for surgery, should be considered for operative treatment.

In 1981, Harrington reported 58 periacetabular metastatic patients and classified these patients into four groups based on location of the fracture within the periacetabular bone, the extent of tumor or radiation osteolysis and the specialized technical requirements needed to accomplish a secure arthroplasty⁽⁴⁾. In class I, the lateral cortices and the superior and medial portions of the acetabulum were structurally intact. Patients with class I lesions were treated by

Table 1. Patient Demographics' characteristics (n = 14)

Patient	Age (yrs) /Sex	Diagnosis	Harrington's Classification	F/U (days)	Preoperative Embolization	Operative Time (hours)	EBL(ml)	Blood Transfusions (unit)	Status	Gait Aid
1	44/F	Thyroid	III	820	+	3.3	2,000	7	AWD	Walker
2	73/F	Thyroid	I	425	+	2.1	2,000	4	AWD	Walker
3	42/F	Breast	I	1,275	-	2.4	1,000	3	AWD	Cane
4	59/F	Thyroid	III	55	+	2.3	2,200	4	DOD	None
5	53/F	Breast	I	42	-	1.5	900	2	DOD	Cane
6	52/M	Kidney	II	288	+	3.1	2,300	6	DOD	Walker
7	38/F	Breast	II	270	-	2.4	300	0	AWD	Cane
8	74/M	Kidney	III	656	+	3.3	1,700	4	AWD	Cane
9	50/M	MM	I	652	-	3.4	5,500	6	AWD	Walker
10	57/M	Lung	I	37	-	2.0	1,200	2	DOD	None
11	59/M	Bladder	II	120	+	1.5	1,800	3	AWD	Crutches
12	71/F	Breast	I	340	-	1.3	300	0	AWD	Walker
13	60/F	Cervix	II	438	-	2.0	600	1	AWD	Walker
14	52/F	Breast	I	389	-	1.5	800	1	AWD	Cane
Mean (range)	56 (38-74)			389 (30-1,275)		2.3 (1.5-3.4)	1,614 (300-5,500)	3 (0-7)		

F/U, follow-up

EBL, estimated blood loss

MI, milliliters

AWD, alive with the disease

DOD, died of the disease

conventional total hip arthroplasty, frequently with placement of mesh along the medial portion of the acetabular wall for reinforcement. In class II, the medial portion of the wall was deficient. Patients with class II lesions were treated with a protrusion ring. In class III, the lateral cortices and the superior portion of the wall were deficient. Patients with class III lesions were treated with Steinmann pins directed along the medullary canal of the ilium in the acetabular prosthetic component. Patients with class IV lesions had only a solitary metastasis in the acetabular area and underwent a wide excision. In Harrington's series, the main technique for acetabular reconstruction in class III was retrograde Steinmann pins technique. In addition, there were antegrade Steinmann pin techniques that were reported by Walker⁽⁶⁾ and Parikh⁽¹⁰⁾. In the present series, the authors used the augmentation technique with plate-screw system that could transmit the force from spine to the structural intact acetabular bone and the durability of reconstruction was acceptable (in patients number 1, 4, and 8).

The results of surgical management in periacetabular metastatic disease are rarely reported and difficult to compare, due to variability in classification as well as type of reconstruction⁽³⁻⁸⁾. The most extensive results on acetabular reconstruction in patients with metastatic disease have been reported by Harrington⁽⁴⁾. Fifty-eight patients were treated by hip replacement arthroplasty for pathological fractures and fracture dislocation of the acetabulum secondary to metastatic diseases. At 6 months, 67% had excellent or good pain relief that remained at 43% even after two years. Eighty percent were ambulatory at 6 months and 45% kept their walking ability after two years. There were two operative deaths, and five patients had loosening of the acetabular prosthetic components due to local tumor recurrence. Marco et al reported a series of 55 patients with metastatic disease of the acetabulum⁽¹¹⁾. Fifty-four of the hips were reconstructed with a protrusional cup and one patient had an endoprosthetic reconstruction of the hemipelvis. Seventy-six percent of the patients had relief from pain. Nine of 18 patients unable to walk preoperatively regained walking ability and another 14 patients regained full ambulatory status. Local progression was seen in 25% of the patients. The mean operative time was 290 ± 72 minutes, the mean estimated blood loss was $2,200 \pm 1,100$ ml. The outcomes of the present series in terms of pain relief and functional maintenance and improvement could be acceptable compared to other studies^(4,5,11).

Periacetabular surgery is a major procedure

and has a risk of complications. Many series that reported the result of this procedure had some life threatening complications and surgical related complications including fatal pulmonary emboli^(12,13), dislocation^(12,13), nerve palsy⁽⁶⁾, venous thrombosis and deep infection⁽¹¹⁾. However, there were few complications. In the present series, there was no perioperative mortality and other major complications. The late failure of the implant due to progression of the disease was reported in many series with a mean time of 12 months⁽¹¹⁾. In general, the median survival of patients with bone metastasis is 6 to 12 months in melanoma, lung, urinary bladder, and thyroid cancer. Furthermore, longer survival rates were found in breast (19-25 months) and prostate cancer (12-53 months)⁽¹⁴⁾. With the advances of treatment modality, the survival of these cancer patients can be prolonged further than previously. In addition, the general surgical procedure for metastatic lesion is intralesional excision of the tumor that can leave a gross tumor, although adjuvant systemic treatment and radiation therapy was used after the operation. For these reasons, a later loosening can occur in a small number of patients. Two patients with late fixation failure occurred 11 and 14 months after the first procedure and were successfully treated by revision surgery.

Conclusion

With the advent of the new strategy for the treatment of cancer, the survival of cancer patients and the number of bony metastases has increased. The quality of life of patients with periacetabular metastatic lesions that deteriorate from unresponsiveness to the non-operative treatments category can be managed with surgical acetabular reconstruction. For proper indication, a thorough oncological work-up is necessary, as well as detailed preparation of the operation in order to decrease intra- and postoperative morbidity. Independent ambulation and pain are significantly improved after surgery in the present series, indicating that acetabular reconstruction for metastasis in selected patients can improve the quality of the remaining life of patients with periacetabular metastatic disease.

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ผลการรักษามะเร็งกระดูกทุติยภูมิบริเวณด้านข้างของกระดูกตะโพกด้วยวิธีผ่าตัด: ประสบการณ์ของโรงพยาบาลศิริราช

ประเสริฐ วังสุตรค, อภิชาติ อัครมงคลกุล, สารเนตร ไวกุล, ระพีพันธ์ พิมลสานต์

ภูมิหลัง: มะเร็งกระดูกทุติยภูมิบริเวณด้านข้างของกระดูกตะโพกพบได้บ่อยจากการแพร่กระจายมาจากมะเร็งของอวัยวะอื่น มักทำให้ผู้ป่วยเกิดความเจ็บปวดและไม่สามารถใช้งานกระดูกบริเวณดังกล่าวได้ตามปกติ การรักษาเริ่มแรกมักใช้วิธีอนุรักษนิยม มักพิจารณาใช้วิธีการผ่าตัดรักษาในกรณีที่ผู้ป่วยใช้วิธีดังกล่าวแล้วไม่ได้ผลหรือมีภาวะกระดูกหักผ่านรอยโรค

วัตถุประสงค์: เพื่อศึกษาผลการใช้งาน คุณภาพชีวิต และโรคแทรกซ้อนในผู้ป่วยที่ได้รับการผ่าตัดบูรณะบริเวณด้านข้างของกระดูกตะโพกที่มีมะเร็งกระดูกทุติยภูมิ

วัสดุและวิธีการ: ผู้ป่วย 14 รายที่มารับการรักษาที่โรงพยาบาลศิริราช โดยการผ่าตัดขูดเนื้ออกของกระดูก และใส่ข้อตะโพกเทียมจำนวน 16 ครั้ง ตั้งแต่ปี พ.ศ. 2545 – พ.ศ. 2549 พบว่ามีมะเร็งแพร่กระจายมาจากเต้านม 5 ราย มะเร็งต่อมไทรอยด์ 3 ราย มะเร็งไต 2 ราย และมะเร็งปากมดลูก มะเร็งกระเพาะปัสสาวะ มะเร็งปอด และ multiple myeloma อย่างละ 1 ราย ผู้ศึกษาได้ทบทวนลักษณะของการแพร่กระจายของมะเร็งกระดูกทุติยภูมิบริเวณด้านข้างของกระดูกข้อตะโพก โดยวิธี Harrington อายุ ปริมาณเลือดที่เสียในระหว่างและหลังผ่าตัด ปริมาณเลือดที่ให้แก่ผู้ป่วยโรคแทรกซ้อนที่เกิดขึ้นหลังผ่าตัด และบันทึกผลการลดลงของความเจ็บปวดโดยวิธี visual analogue scale ภายหลังผ่าตัด

ผลการศึกษา: พบค่าเฉลี่ยของอายุผู้ป่วย 56 ปี และมีค่าเฉลี่ยของระยะเวลาที่ติดตามผู้ป่วยนาน 389 วัน (ช่วง 30-1,275 วัน) ค่าเฉลี่ยของระยะเวลาที่ได้รับการวินิจฉัยจากมะเร็งแรกเริ่มจนกระทั่งมีการแพร่กระจายไปที่กระดูก 32.5 เดือน (ช่วง 0-84 เดือน) ลักษณะของการแพร่กระจายของมะเร็งกระดูกทุติยภูมิโดย Harrington พบว่าผู้ป่วย 7 ราย เป็น Class I โดย 4 รายเป็น Class II และ 3 รายเป็น Class III ค่าความเฉลี่ยของความเจ็บปวดโดยวิธี visual analogue scale ลดลงจากก่อนผ่าตัด 8/10 เป็น 2/10 ภายหลังผ่าตัด ผู้ป่วยทุกรายสามารถลุกเดินออกจากเตียงได้ด้วยตนเอง และมี 2 รายที่เดินได้เองโดยไม่ต้องใช้อุปกรณ์ช่วยพยุงเดิน ผู้ป่วย 4 ราย เสียชีวิตจากโรค และ 10 รายยังคงมีชีวิตอยู่ พบว่าผู้ป่วย 2 รายมีปัญหาแทรกซ้อนภายหลังผ่าตัดจากข้อตะโพกหลุดไปด้านหลังและข้อตะโพกเทียมหลวมหลุด ผู้ป่วยทั้ง 2 รายได้รับการรักษาให้หายโดยการดึงข้อตะโพกเข้าที่ และผ่าตัดเปลี่ยนข้อตะโพกเทียมใหม่ตามลำดับ

สรุป: จากการศึกษาได้แสดงให้เห็นว่าการผ่าตัดเปลี่ยนข้อตะโพกเทียมในผู้ป่วยที่เป็นมะเร็งกระดูกทุติยภูมิตรงบริเวณกระดูกรอบข้อตะโพก สามารถลดความเจ็บปวดและทำให้คุณภาพชีวิตของผู้ป่วยดีขึ้น พบอัตราการเกิดปัญหาแทรกซ้อนภายหลังผ่าตัดต่ำ จึงควรพิจารณาการผ่าตัดชนิดนี้ให้แก่ผู้ป่วยที่มีปัญหาดังกล่าวที่มีสภาพร่างกายแข็งแรงและมีชีวิตยืนนานอยู่ได้พอสมควร
