

가

:

29

13 16
가 Perez

ma), , 11 , 4 , 3 , 2 , (adenocarcino
), 11.7 가 10 (), 4 7 (10 , 28.9
), 16 13 가 3 3 3 10

(solid cancer)

(long bone) , , 15 ~ 20%
10 ~ 15%

65-1

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25) 가 , ()
 2,000 Clair¹⁾)
 (69%), (41%), (25%),
 (25%), (14%)
 20% 가
 9.6% , 가

22)
 1998 1 1 2002 12 31 가
 29
 가⁷⁾, 13 16
 reamer
 가 6 가 7
 38 81 59
 10 4 7
 31.2
 21) 가 Perez , ,
 (Table1).
 polymethylmethacrylate(PMMA)

10,11,17,24,27,28)
 (interlocking intramedullary nail) (multiple myeloma) 4
 , 3 , 2 (adenocarcinoma), 1
 . 2

Table 1. Modification of The Rating System of Perez et al.

Rating	
Pain Relief	
Excellent	Essentially complete relief of pain
Good	Mild discomfort; occasional use of mild analgesics
Fair	Moderate pain
Poor	Unchanged from pretreatment pain level
Function	
Excellent	Essentially normal function
Good	Slight impairment of use of upper extremity, but able to perform well the activities of daily living
Fair	Limited use of upper extremity
Poor	Inability to use extremity

11, 1, 3 (Table 2).
 10, 28.9, 4, 1, 3
 가, 10 (, 11.7, 2, 4, 3
 . 11, 3~4, 1
 , 8, 10
 가 . 1
 2, 가 6, 5, 3, 2, 1, 10
 가 2, 가 7, 4,

Table 2. Data on 16 Cases of The Humerus metastasis treated with Interlocking Intramedullary Nail

Case	Age (yrs)/ Sex	Diagnosis	Time from Diagnosis to Fracture (Mos)	Pain relief	Function	Adjuvant Therapy	Durat. of Survival or Follow-up (Mos)
1	38/M	Lung cancer	1	Good	Good	Chemo(+) RT(+)	16
2	55/F	Breast cancer	17	Excellent	Excellent	Chemo(+)	4
3	81/M	Renal-cell carcinoma	120	Fair	Good	RT(+)	2.5
4			122	Fair	Fair	RT(+)	1.5
5	50/M	Multiple myeloma	6	Good	Good	Chemo(+) RT(+)	6
6			9	Good	Good	Chemo(+) RT(+)	3
7	69/F	Multiple myeloma	1	Good	Good	Chemo(+)	62
8			1	Fair	Fair	Chemo(+)	62
9	67/F	Stomach	39	Poor	Poor	Chemo(+) RT(+)	9
10	65/M	Colon	7	Good	Good	RT(+)	6
11	46/M	Multiple myeloma	55	Fair	Fair	Chemo(+) RT(+)	13
12	44/M	Multiple myeloma	36	Excellent	Excellent	Chemo(+)	16
13	64/F	Lung cancer	8	Poor	Poor	Chemo(+)	5
14	65/F	Lung cancer	14	Poor	Poor	Chemo(+)	3
15	65/F	Adeno-carcinoma, unknown origin	0	Fair	Fair	RT(+)	3
16	59/F	Breast cancer	60	Good	Good	RT(+)	6

RT: Raditherapy

Chemo: Chemotherapy

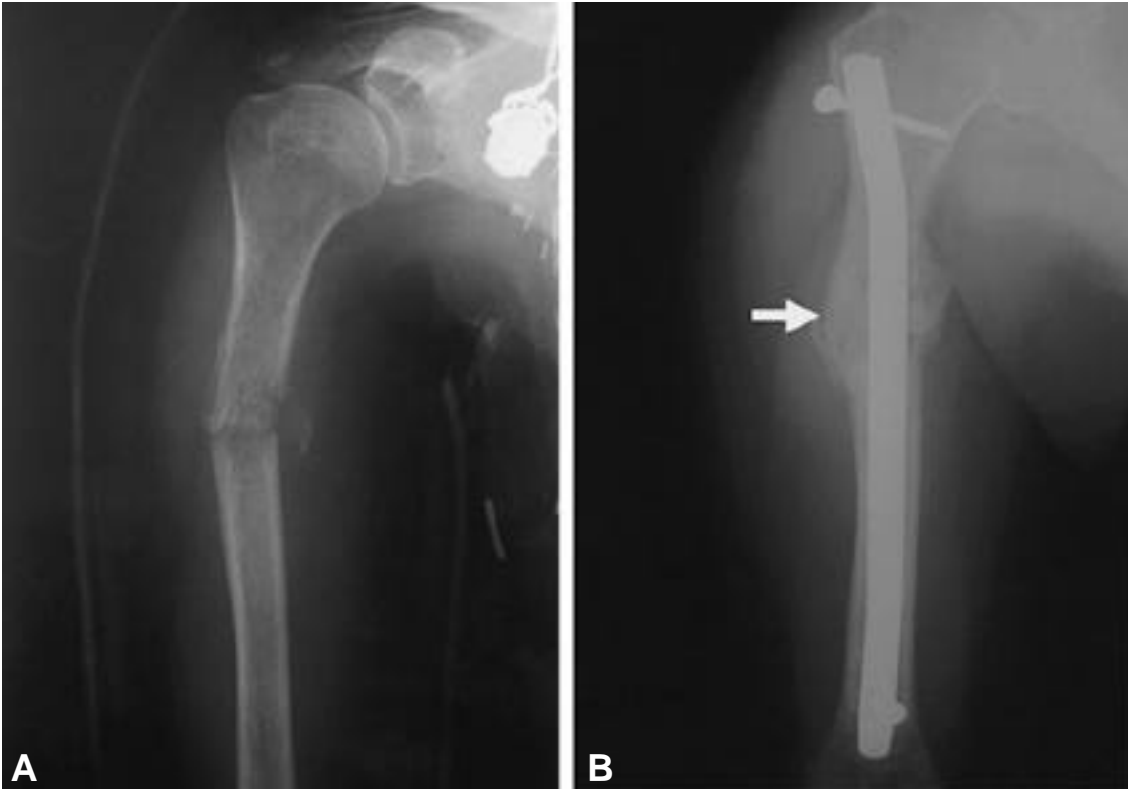


Fig. 1. **A.** Plain radiograph shows an ill-defined moth-eaten destruction with pathologic fracture of diaphysis of humerus. The patient was 55-years old lady with breast cancer for 16 months. **B.** Plain radiograph demonstrates radiologic union with abundant callus formation at 10 weeks postoperatively. The final result was excellent both in pain relief and function recovery.

(Fig. 1). 1 가

10 . ,

1

, 1 4 (Fig. 2).

2 3~4

가

, (Fig. 3).

1 5 16)

(Fig. 4). 1

10 , Douglass ⁶⁾

10

7,16,17,26,27)

1 6 8~10

3 4~6 가

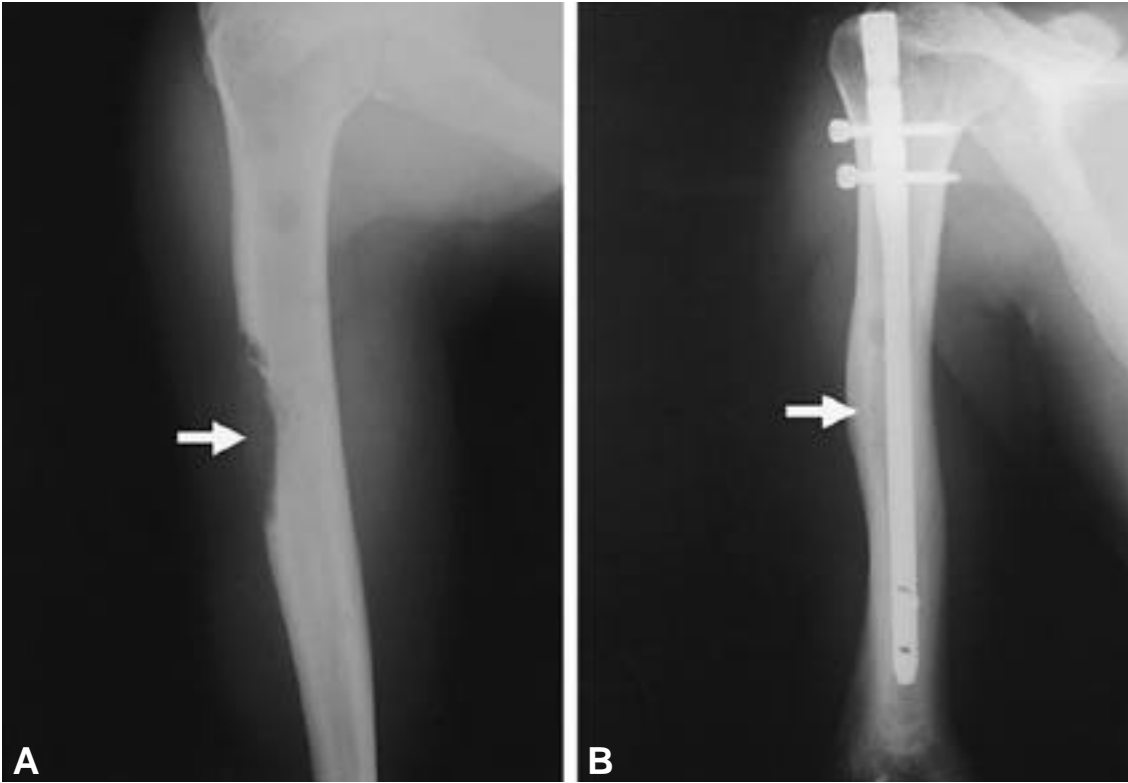


Fig. 2.A. Plain radiograph shows a large destructive lesion involving cortex and part of medulla of shaft of humerus. The patient was 38-years old man with lung cancer for 1 month. **B.** Plain radiograph reveals perfect new bone formation at 1 year after surgery and postoperative radiotherapy. The final result was good both in pain relief and function recovery.

4,27) , 10,11,17,24,27,28) , 28.9 , 11.7 , 10) , 3 , PMMA , 11,19) , 가 , 22) , 21,27) , 가 , Schatzker²⁴⁾ PMMA , Lancaster¹⁶⁾ , 5,7,16,20,22) , Kuntcher nail , PMMA , Rush , 가 가 , 가

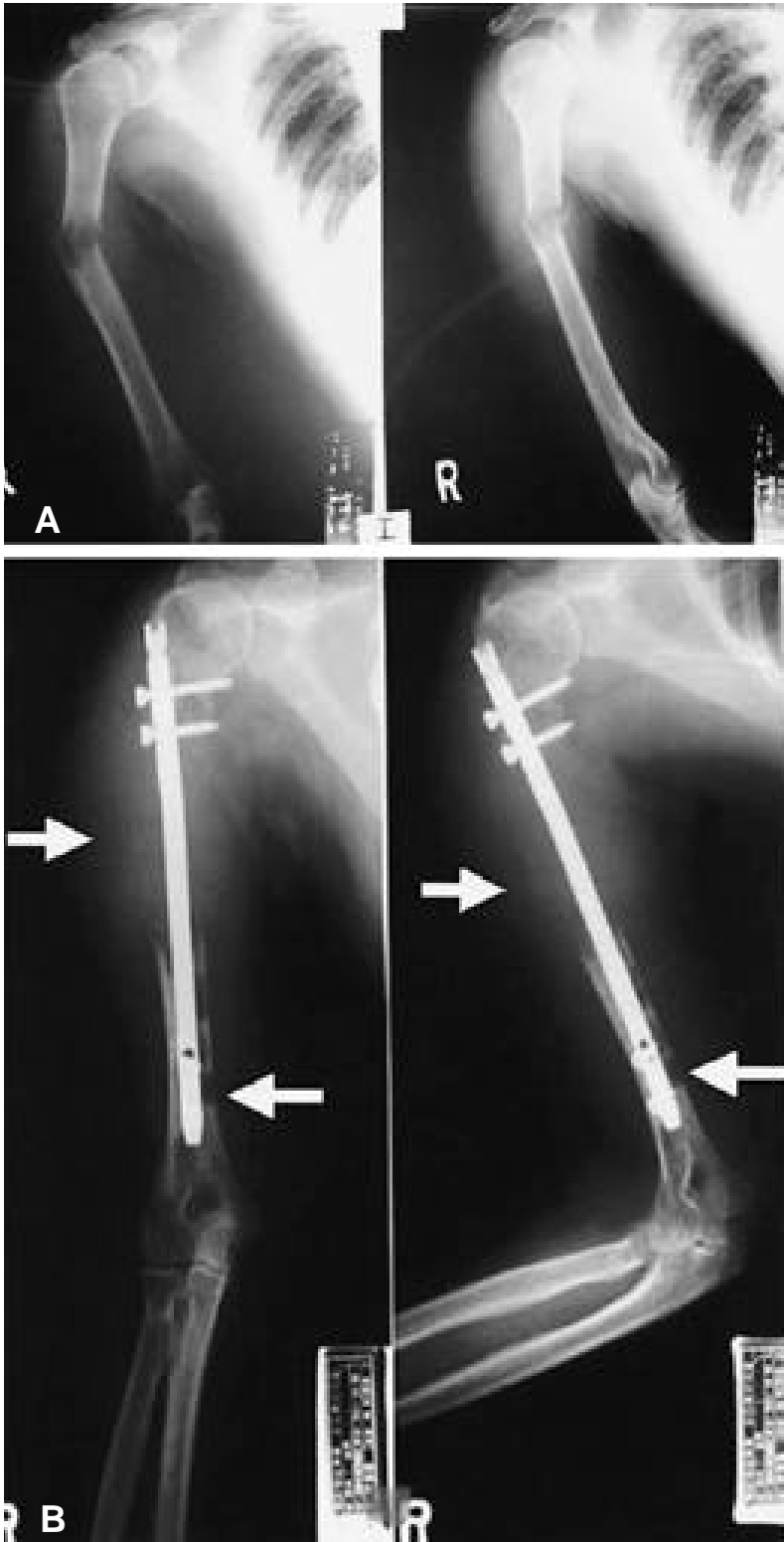


Fig. 3. A. Plain radiograph shows ill-defined geographic destruction with pathologic fracture of diaphysis of humerus. The patient was 63-years old lady with lung cancer for 8 months. **B.** Plain radiograph demonstrates significant tumor progression with loss of fixation failure at 3 months after surgery. The final result was poor both in pain relief and function recovery.



Fig. 4.A. Plain radiograph shows an ill-defined moth-eaten destruction with pathologic fracture of diaphysis of humerus (left) and immediate post-operative state (right). **B.** Plain radiograph demonstrates significant tumor progression at 4 months after surgery (left) and consolidation of the lesion after radiotherapy. **C.** Plain radiograph reveals osteolytic lesions with bizarre exostotic masses involving distal phalanges of 5 digits. The final result was poor both in pain relief and function recovery.

3
1988 Chin³⁾ 가 2 3~4 가
titanium segmental defect prosthesis
, Rush 가
1996 Damron⁵⁾ 17 inter- 1951 Peltier¹⁹⁾ 가
calary spacer , 30%
가
Vail Harrelson²⁸⁾ Rush PMMA Hoare¹³⁾
, 21 4 , Zickel Mouradian²⁹⁾ 1
(tumor progression)
3 (fixation failure) Harrington¹⁰⁾ 375 1
가
Gainof⁸⁾ Madden Karpas¹⁸⁾
가 6
, 6 Peltier
3000 rad . Knutson Spratt⁵⁾ 가
, Bouma¹⁾
(interlocking 185 가
intramedullary nailing) Bouma²⁾ 가
가
. 1996 Redmond 가 가
²²⁾ 가
1 가 (acrometastasis) 가
. 4/1 6/1 0.2% ^{4,14)}
(interlocking screw) 1 ,
, 1 가가 가 ¹²⁾
13 , 16 16 1

REFERENCES

- 1) **Bouma WH**: The surgical treatment of pathologic and impending pathologic fractures. *Dissertation, Amsterdam*, 1981.
- 2) **Bouma WH, Mulder JH, Hop WCJ**: The influence of intramedullary nailing upon the development of metastases in the treatment of an impending pathologic fracture: an experimental study. *Clin Expl Metastasis*, 1(3):205-212, 1983.
- 3) **Chin HC, Frassica FJ, Hein TJ, Shives TC, Prichard DJ, Sim FH et al.**: Metastatic diaphyseal fractures of the shaft of the humerus. The structural evaluation of a new method of treatment with a segmental defect prosthesis. *Clin Orthop*, 248:231-239, 1989.
- 4) **Clain A**: Secondary malignant disease of bone. *Br J Cancer*, 19:15-29, 1956.
- 5) **Damron TA, Sim FH, Shive TC, An KN, Rock MG, Prichards DJ**: Intercalary spacer in the treatment of segmentally destructive diaphyseal humeral lesions in disseminated malignancies. *Clin Orthop*. 324:233-243, 1996.
- 6) **Douglass HO Jr, Shukla SK and Mindell E**: Treatment of pathologic fracture of long bones excluding those due to breast cancer. *J Bone Joint Surg*. 58-A:1055-1061, 1976.
- 7) **Flemming JE and Beals RK**: Pathologic fracture of the humerus. *Clin Orthop*, 203:258-260, 1986.
- 8) **Gainor BJ and Buchert P**: Fracture healing in metastatic bone disease. *Clin Orthop*, 178:297-302, 1983.
- 9) **Haberman ET and Lopez RA**: Metastatic disease of bone and treatment of pathologic fractures. *Orthop Clin North America*, 20:469-489, 1989.
- 10) **Harrington KD, Johnston JO, Turner RH and Green DL**: The use of methylmethacrylate as an adjunct in internal fixation of malignant neoplastic fractures. *J Bone Joint Surg*, 54A:1665-1676, 1972.
- 11) **Harrington KD, Sim FH, Enis JE, Johnston JO, Dick HM and Gristina AG**: Methylmethacrylate as an adjunct in internal fixation of pathologic fractures. Experience with three hundred and seventy-five cases. *J Bone Joint Surg*, 58-A:1047-1055, 1976.
- 12) **Healey JH, Turnbull ADM, Miedema B and Land JM**: Acrometastases. A study of 29 patients with osseous involvement of the hand and foot. *J Bone Joint Surg*, 68-A: 743-746, 1986.
- 13) **Hoare W**: Malignant neoplastic fractures. Pathologic fractures. *J Bone Joint Surg*, 50B: 232- , 1968.
- 14) **Kerin R**: Metastatic tumors of bone. *J Bone Joint Surg*, 65-A:1331-1334, 1983.
- 15) **Knutson CO and Spratt JS**: The natural history and management of mammary cancer metastatic to the femur. *Cancer*, 26:1199-1203, 1970.
- 16) **Lancaster JM, Koman LA, Gristina AG et al.**: Pathologic fractures of the humerus. *Southern Med J*, 81:52-55, 1988.
- 17) **Lewallen RP, Prichard DJ and Sim**: Treatment of pathologic fractures or impending fractures of the humerus with Rush rods and methylmethacrylate. Experience with 55 cases in 54 patients, 1968-1977. *Clin Orthop*, 166:193-198, 1982.
- 18) **Madden RE and Karpas**: Arrest of circulating tumor cells versus metastases formation. *Archives Surg*, 94:307-312, 1967.
- 19) **Peltier LF**: Theoretical hazards in the treatment of pathologic fractures by the Kuntcher intramedullary nail. *Surgery*, 29:466-471, 1951.
- 20) **Perez CA, Bradfield JS, Morgan HS**: Management of pathologic fractures. *Cancer*.

- 29:684-693, 1972.
- 21) **Prichards DJ**: Pathologic fractures of the humerus. *Orthopedics*, 15:557-562, 1992.
 - 22) **Redmond BJ, Biermann JS and Blasier RB**: Interlocking intramedullary nailing of pathologic fractures of the shaft of the humerus. *J Bone Joint Surg*, 78-A:891-896, 1996.
 - 23) **Sarmiento A, Kinman PB, Galvin EG, Schmitt RH, Phillips JG**: Functional bracing of fractures of the shaft of the humerus. *J Bone Joint Surg*, 59A:569-, 1977.
 - 24) **Schatzker J and Ha 'Eri EB**: Methylmethacrylate as an adjunct in internal fixation of pathologic fractures. *Can J Surg*, 22:179- , 1979.
 - 25) **Sherry HS, Levy RN and Siffert RS**: Metastatic disease of bone in orthopedic surgery. *Clin Orthop*, 169:44- , 1982.
 - 26) **Sim FH, Daugherty TW and Ivins JC**: The adjunct use of methylmethacrylate in fixation of pathologic fractures. *J Bone Joint Surg*, 56A:40-48, 1974.
 - 27) **Sim FH and Prichard DJ**: Metastatic disease in the upper extremity. *Clin Orthop*, 169:83-94, 1982.
 - 28) **Vail TP and Harrelson JM**: Treatment of pathologic fractures of the humerus. *Clin Orthop*, 268:197-202, 1991.
 - 29) **Zickel RE and Mouradian WH**: Intramedullary fixation of pathologic fractures and lesions of the subtrochanteric region of the femur. *J Bone Joint Surg*, 58A:1061-1066, 1976.

Closed Interlocking Intramedullary Nailing of Metastatic Diaphyseal Fractures of the Humerus

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Purpose: To analysis of the result of the treatment of metastatic diaphyseal fracture of the humerus with closed interlocking intramedullary nailing.

Materials and Methods: Among surgically treated 29 patients with pathologic or impending fracture of diaphysis of the humerus, 13 patients (16 cases) treated with closed intramedullary interlocking nail were selected for the study. The final result of pain relief and functional recovery was evaluated by modified rating system of Perez et al.

Results: Primary cancer was diagnosed after fracture was developed in 2 patients and pathologic or impending fracture was occurred average period of 28.9 months after primary cancer was diagnosed. The main primary malignancies were multiple myeloma, lung cancer and breast cancer. Mean survival after humeral metastasis was 11.7 months. The final result was superior to fair in 13 of 16 cases, and poor in 3 cases with progression of tumor spread or distant dissemination to the ipsilateral fingers. Except the latter 3 patients and other 3 patients, who died before 3 months postoperatively, bony union was achieved in 10 cases. There were no complications related to surgery.

Conclusion: Closed interlocking intramedullary nailing is accomplished with brief operative time, small amount of bleeding and provides immediate stability with resultant early return of function to the arm. Additionally it allows early postoperative irradiation. However, some of our cases shows that intramedullary nailing can accelerate tumor spread and metastases elsewhere, so that serious consideration must be given in planning this treatment. In conclusion, the functional status before fracture, life expectancy, type of tumor and extent of involvement should be carefully considered to decide operative treatment of metastatic disease.

Key Words: Diaphysis of humerus, Pathologic fracture, Closed interlocking intramedullary nailing

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