



1

2

(opposing bone) 가 11

(synovial hyaline cartilage portion) (fibrous ligamentous portion)

가 가 (direct invasion) (opposing bone)

(indirect invasion)

6 5 8 3

191.8 cm<sup>2</sup> 69.6 cm<sup>2</sup>

가

5

(opposing bone) 1

2 1

2

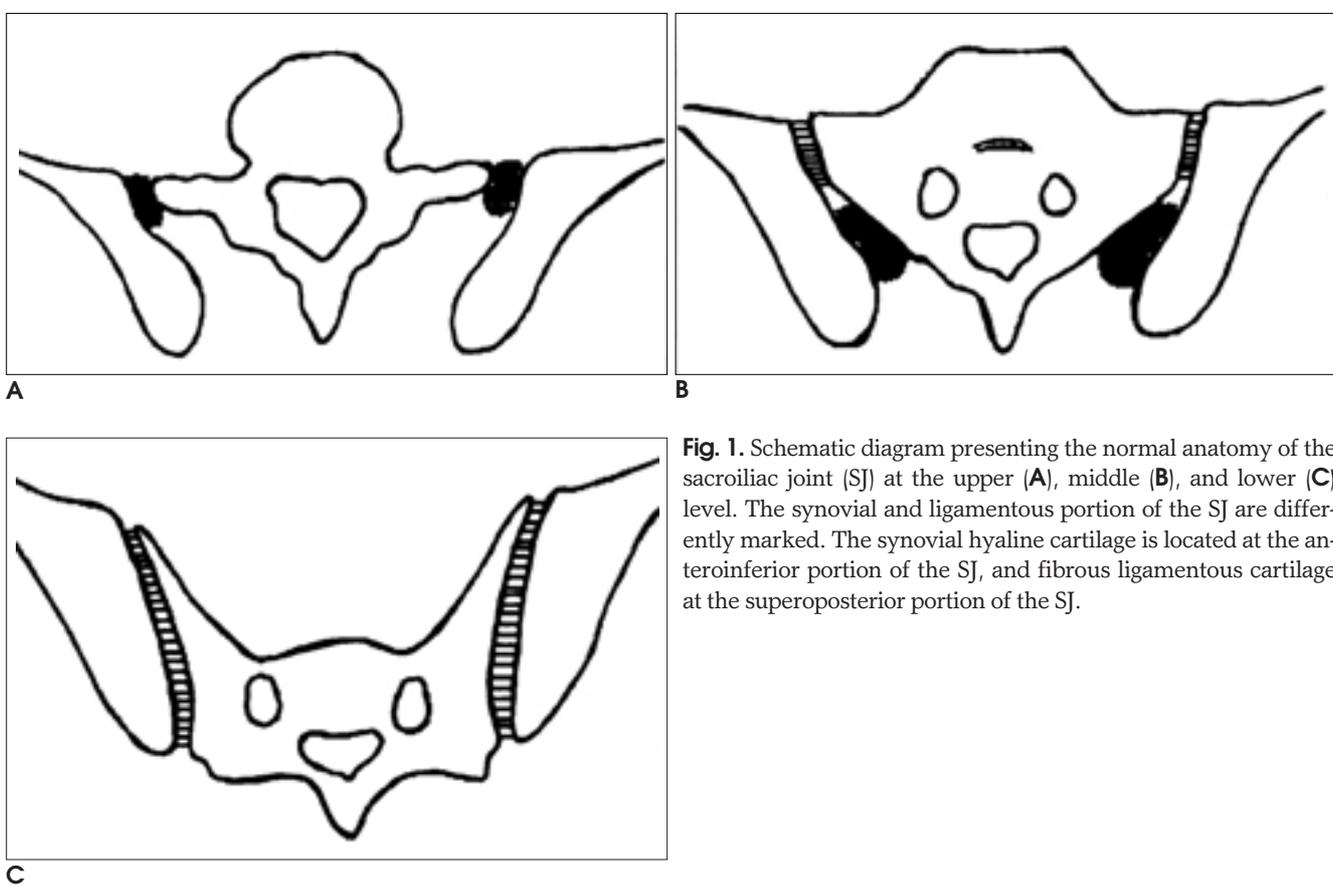
(periphery) 가 (opposing bone)

(1, 2). partment) 가 (surgical margin)

(multicom - (3).

(synovial joint)  
 fluid) (immobile)  
 (4 - 7).  
 (fibrous ligamentous cartilage)  
 hyaline cartilage)  
 가 .  
 (true syn-  
 (width)  
 2 mm 5 mm  
 (arthrotic change) 30  
 , 50  
 (4, 8 - 10).  
 가

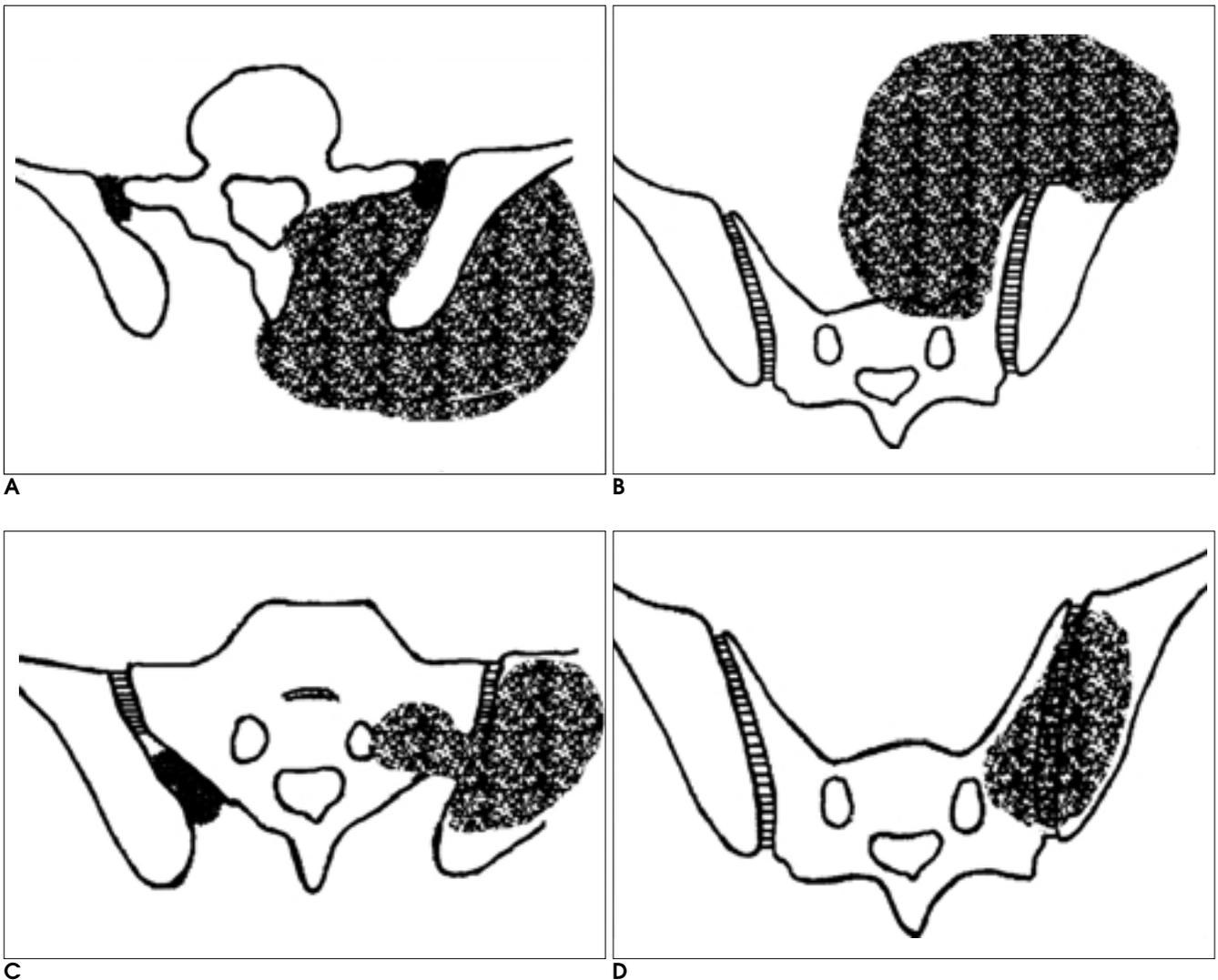
CT MRI  
 (opposing bone)  
 가 ,  
 (7, 9).  
 1994 5 1999 6  
 11  
 4 ,  
 가 3 ,  
 , 1 , 5 , 6  
 , 28 62 , 47  
 5 CT MRI , 3  
 CT MRI , 2 MRI , 1  
 MRI 10  
 R - 500 - 150(Shimadzu, Kyoto,  
 Japan) . CT Shimadzu SCT - 5000T (Shimadzu,  
 Kyoto, Japan) 5 mm  
 . MRI 1.0 Tesla  
 SMT 1.0(Shimadzu, Kyoto, Japan)  
 (spine echo: SE) (repetition



**Fig. 1.** Schematic diagram presenting the normal anatomy of the sacroiliac joint (SJ) at the upper (A), middle (B), and lower (C) level. The synovial and ligamentous portion of the SJ are differently marked. The synovial hyaline cartilage is located at the anteroinferior portion of the SJ, and fibrous ligamentous cartilage at the superoposterior portion of the SJ.

time, TR) 500 msec, (echo time, TE) 15 msec  
 T1 2000 msec 3000 msec  
 90 msec T2  
 Gadolinium - DTPA 0.1 mmol/Kg  
 Field of view 200 mm 300 mm  
 (matrix number) 256 x 256, (number of  
 excitation) 4 10 mm ( 2  
 mm) (axial scan) (coronal scan)

가  
 (synovial hyaline cartilage)  
 (fibrous ligamentous cartilage) (Fig. 1) (4 - 7, 11).  
 2 mm  
 (8, 9),  
 가 (opposing bone)  
 (direct invasion)  
 가 (periphery)  
 가  
 (detour invasion)  
 (indirect invasion) (Fig. 2).



**Fig. 2.** Schematic diagram demonstrating the modes of transarticular invasion at the sacroiliac joint(indirect: **A** and **B**, direct: **C** and **D**). An extension of the soft tissue mass around the joint from peripheral portion to the opposing bone (**A**), a detour transarticular invasion of soft tissue mass around the joint without invasion of the intervening cartilage (**B**), the transarticular invasions of tumors directly across the joint (**C**, **D**).

5 가

1 . 5 ,

11 . 5 5 (oppos -

3 가 . 11 8 , ing bone)

11 7 가 , 3 (Fig. 3).

1 1 가

8 가 , (opposing bone) (detour invasion)

2 . 1 (Fig. 4).

7 1 , 5 .

1 , , , 5 .

11 3 , , 가

8 3 2 , , 가

1 2 , 1 2 , ,

(Table 1).

가 2 . 3 2 ,

(peripheral portion) 가 2 1

가 11 6 , 가

가 5 . , 70

cm<sup>2</sup> 270 cm<sup>2</sup> , 191.8 cm<sup>2</sup> , 30

cm<sup>2</sup> 150 cm<sup>2</sup> , 69.6 cm<sup>2</sup> . 2

2 , , , 2 , , ,

2 (Fig. 5).

( : 2, : 1)

4 2 가 , 6 3

Table 1. Sacroiliac Joint Invasion by Malignant Pelvic Bone Tumors

Case	Age /Sex	Histologic diagnosis	Location of tumor	Size of tumor (cm <sup>2</sup> )	Ankylosis	Invaded cartilage	Mode of extension
1	28/M	Chondrosarcoma	Ilium	15 × 18	Negative	Ligamentous, upper posterior	Indirect
2	39/F	Chondrosarcoma	Ilium	15 × 13	Negative	Ligamentous, upper posterior	Indirect
3	31/M	Chondrosarcoma	Ilium	16 × 10	Negative	Ligamentous, upper posterior	Indirect
4	61/F	Chondrosarcoma	Sacrum	10 × 7	Positive	Ligamentous, upper posterior	Indirect
5	37/F	Osteosarcoma	Ilium	18 × 14	Negative	Ligamentous, upper posterior	Indirect
6	62/F	Osteosarcoma	Ilium	17 × 12	Negative	Not*, lower anterior	Detour
7	40/F	Osteosarcoma	Ilium	10 × 7	Negative	Ligamentous, upper posterior	Direct
8	52/F	Rad. induced sarcoma†	Ilium	7 × 5	Negative	Ligamentous, upper posterior	Direct
9	51/M	Metastasis	Sacrum	6 × 5	Negative	Ligamentous, middle posterior	Direct
10	61/M	Multiple myeloma	Ilium	15 × 10	Positive	Synovial, lower anterior	Direct
11	56/M	Chordoma	Sacrum	9 × 7	Positive	Synovial, lower anterior	Direct

\*Not : Absence of cartilage invasion

† : Radiation induced sarcoma

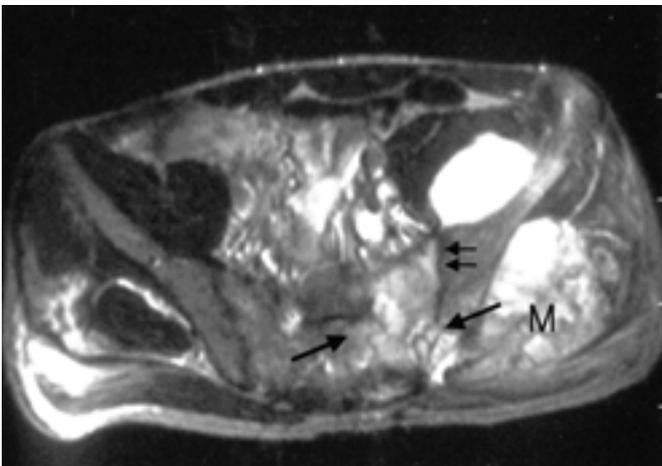
Enneking (1, 2). (intra-compartment) (extracompartment) (multiplanar) 가 MRI가 가 (12, 13). (opposing bone) 가 MRI가 가 (7, 9). 가 (bony interdigitation) (immobile) (intervertebral disc space), (facet joint) 가 (7). CT가 , Schima (14) 가 (false positive) MRI (opposing bone) 가 (7, 9). 가 가 (bony interdigitation) (immobile) (intervertebral disc space), (facet joint) 가 (7).



A



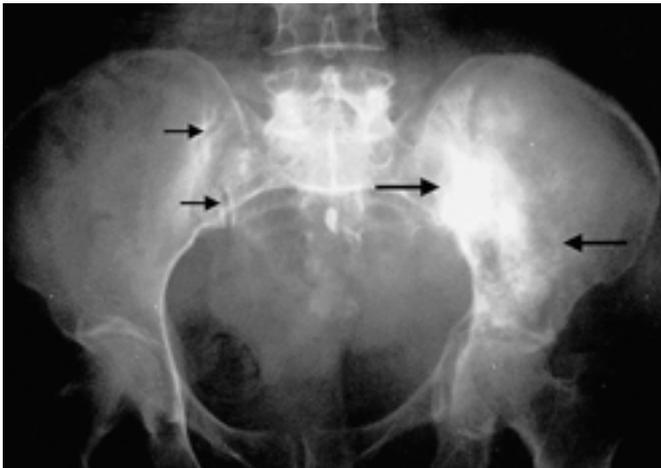
B



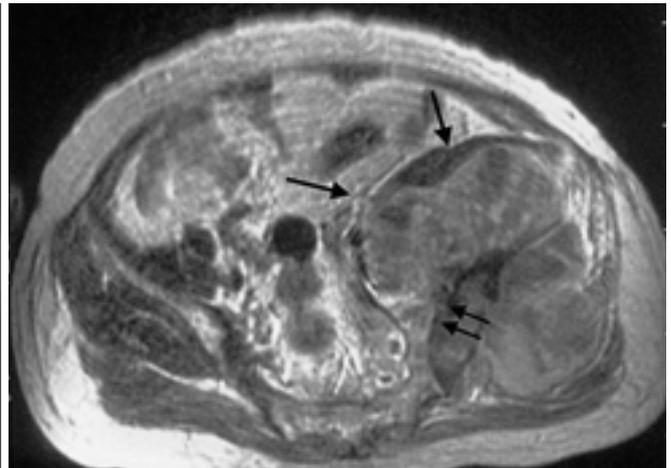
C

**Fig. 3.** A 28-year-old male with indirect transarticular invasion of osteosarcoma  
**A.** Anteroposterior view of pelvis demonstrates a lucent lesion involving left side iliac bone and extending to sacrum (large arrows) at the upper level of sacroiliac joint (SJ). Note absence of ankylosis at the contralateral side (small arrows) of the involved SJ.  
**B.** Axial CT scans through the SJ shows a soft tissue mass (M) abutting to the peripheral portion of the left SJ (open arrows). The tumor destroys the cortical bone of the sacrum (arrowheads) at the upper (not shown) and the middle level of the left SJ.  
**C.** Corresponding axial T2-weighted MR image exhibits a huge soft tissue mass (M) abutting to the peripheral portion of the left SJ and invading fibrous ligamentous cartilage (large arrows). MR image better demonstrates the medullary involvement of the sacrum. Note the intact anterior synovial hyaline cartilage (short arrows).

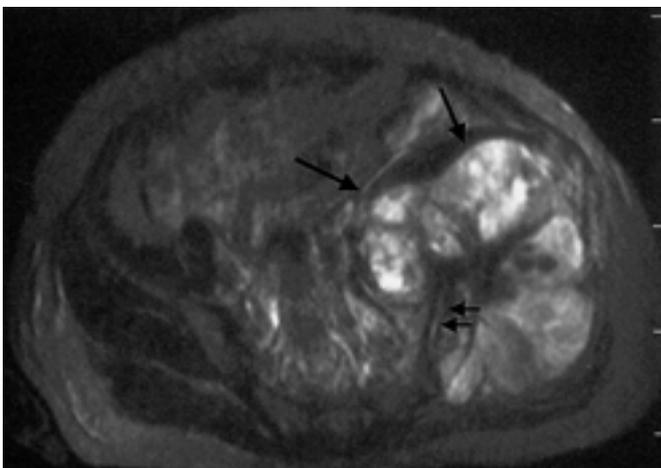
Ozaki (hardness)가 (peripheral portion) 191.8 cm<sup>2</sup> 가 (extracellular chondroid matrix) 가 (8 - 10). (opposing bone) 가 (direct invasion) (detour invasion) (Fig. 4). (erosion) 가 (neoangio - genesis) collagenase (15 - 20). Simon (11) 3가 (pelvic cavity)



A

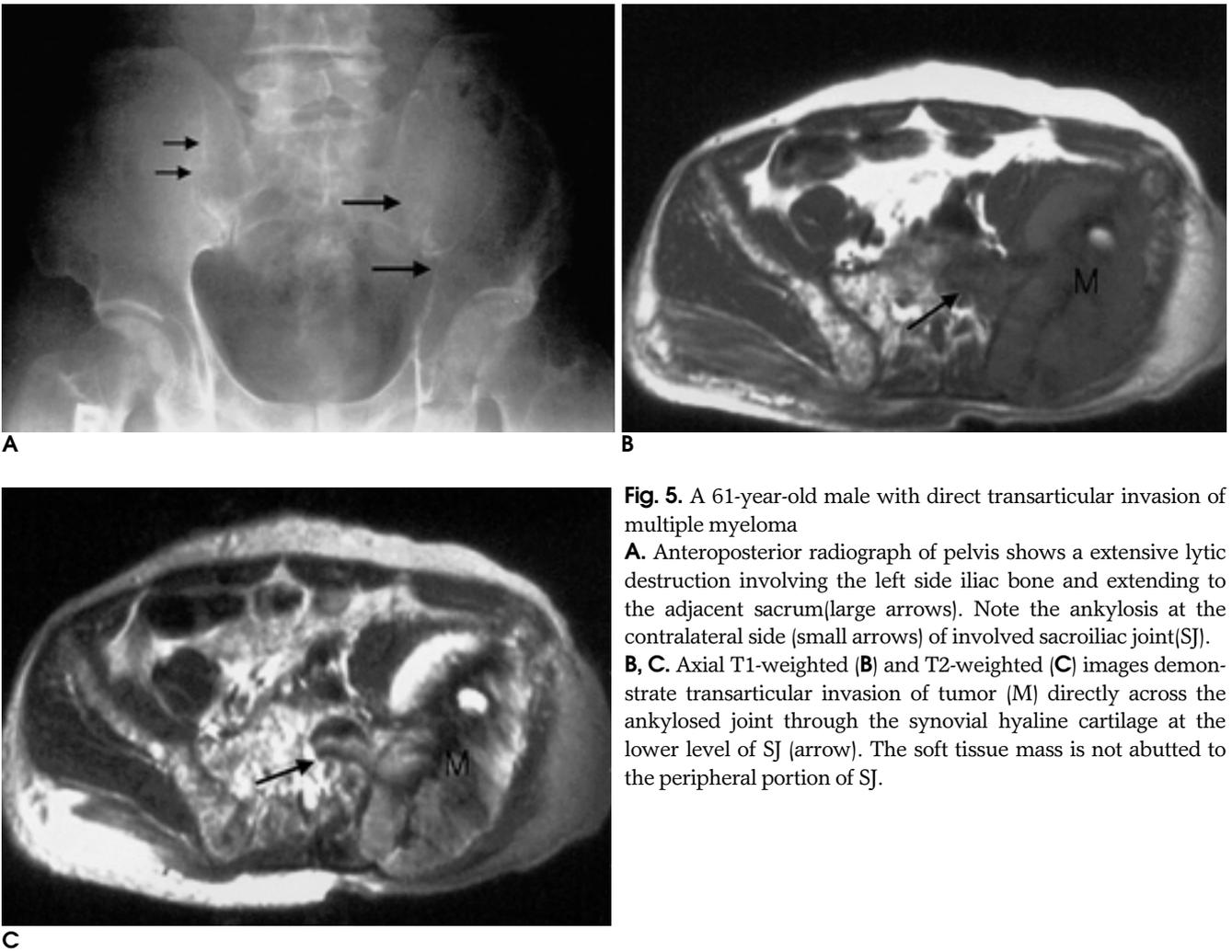


B



C

**Fig. 4.** A 62-year-old female with detour transarticular invasion of osteosarcoma  
**A.** Anteroposterior radiography of pelvis demonstrates a sclerotic lesion involving the major part of left ilium and extending to the adjacent sacrum (large arrows) at the lower level of sacroiliac joint (SJ). Note absence of the ankylosis at the contralateral side (small arrows) of involved SJ.  
**B, C.** Axial Gadolinium enhanced T1-weighted (**B**) and T2-weighted (**C**) MR images show a detour transarticular invasion by a huge soft tissue mass (large arrows) at the lower level of SJ without involvement of the intervening synovial hyaline cartilage (small arrows).



**Fig. 5.** A 61-year-old male with direct transarticular invasion of multiple myeloma  
**A.** Anteroposterior radiograph of pelvis shows a extensive lytic destruction involving the left side iliac bone and extending to the adjacent sacrum (large arrows). Note the ankylosis at the contralateral side (small arrows) of involved sacroiliac joint (SJ).  
**B, C.** Axial T1-weighted (**B**) and T2-weighted (**C**) images demonstrate transarticular invasion of tumor (M) directly across the ankylosed joint through the synovial hyaline cartilage at the lower level of SJ (arrow). The soft tissue mass is not abutted to the peripheral portion of SJ.

가 11 7 ( 64%) 가  
 1  
 73%)  
 11 8 (  
 가  
 가  
 (microinvasion)  
 가  
 Simon  
 (11)  
 2  
 (true synovial joint)  
 가

가  
가 (opposing bone)

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## Transarticular Invasion of the Sacroiliac Joints by Malignant Pelvic Bone Tumors<sup>1</sup>

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**Purpose:** To describe modes of transarticular invasion, with reference to the size and location of a tumor, the anatomic characteristics of invaded cartilage, and the existence of ankylosis in SI joint.

**Materials and Methods:** Eleven histologically confirmed malignant pelvic bone tumors involving transarticular invasion of sacroiliac joints, were retrospectively analysed. Transarticular invasion of a joint was defined as involvement of its opposing bones. The anatomic site and size of the tumors were analysed, and invaded sacroiliac joint was divided into upper, middle and lower parts on the basis of the anatomic characteristics of the intervening cartilage: synovial hyaline or fibrous ligamentous. The existence of ankylosis was determined, and transarticular invasion directly across a joint was classified as direct invasion. Extension of tumors around a joint from its periphery to the opposing bone were considered as indirect invasion.

**Results:** All tumors were located near the sacroiliac joint, eight at the ilium and three at the sacrum. Six invasions were indirect and five were direct. Average tumor area was larger in indirect cases than in direct: 191.8 cm<sup>2</sup> vs. 69.6 cm<sup>2</sup>. In all indirect invasions, a huge soft tissue mass abutted onto the peripheral portion of the sacroiliac joint. In five of six cases of indirect transarticular invasion, the upper part of the joint posteriorly located fibrous ligamentous cartilage. In the other, the lower part was invaded, and this involved a detour around the joint space, avoiding the invasion of intervening cartilage. Ankylosis occurred in one of the indirect cases. Among the five cases of direct invasion, there was invasion of the posteriorly located ligamentous fibrous cartilage in three without ankylosis. In the other two cases, involving ankylosis, the synovial hyaline cartilage was invaded directly at the lower part of the joint.

**Conclusion:** Transarticular invasions of sacroiliac joint via fibrous cartilage are most common. Ankylosis of the sacroiliac joint facilitates hyaline cartilage invasion. We consider that in transarticular invasion of malignant pelvic bone tumors, indirect invasion is more common than direct.

**Index words :** Bone, neoplasms  
Joints, sacroiliac  
Joints, MR

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