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CASE REPORT

Non-monomelic synchronous primary multicentric chondrosarcoma : A case report

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We report a patient with simultaneous presentation of two histologically grade 2 conventional chondrosarcomas non-derived from pre-existing cartilaginous lesions, in the absence of pulmonary or visceral involvement. One tumour was located at the right proximal femur and the other one at the right scapula. There was no evidence of local recurrence or pulmonary or visceral involvement three years and a half after total scapulectomy and resection of the proximal third of the femur. To the best of our knowledge, this is the first report of a patient with two non-monomelic synchronous chondrosarcomas arising in two previously normal bones of the skeleton. Such cases are often difficult to differentiate from metastatic disease.

INTRODUCTION

Chondrosarcoma has been defined by the World Health Organisation as a "malignant tumour with pure hyaline cartilage differentiation" (*11*) ; chondrosarcoma constitutes approximately 20 percent of all primary malignant bone neoplasms. It is the third most common primary sarcoma of bone after multiple myeloma and osteosarcoma.

Except for the highly aggressive mesenchymal chondrosarcoma, it is extremely unusual to see a tendency for multicentricity in malignant cartilage tumours. This rare condition is characterised by the presence of two or more separate chondrosarcomas in the absence of visceral involvement between the time of diagnosis of both tumours, and its prognosis is generally poor. In a literature search for multicentric chondrosarcoma (MC) we have only found 15 reported cases other than those from mesenchymal chondrosarcoma (*3-7, 12, 14, 19*). We report herein a new case of MC with synchronous involvement of two different bones with no benign precursor lesions, a feature that, to our knowledge, has never been reported to date.

CASE REPORT

In April 2001, a 54-year-old man smoking 20 cigarettes a day presented with a history of pain over the lateral side of the right femur of unknown duration, non-related with prior trauma. He also reported 8 Kg weight loss over the last year. Physical examination revealed pain and inflammation in the right subtrochanteric region, that

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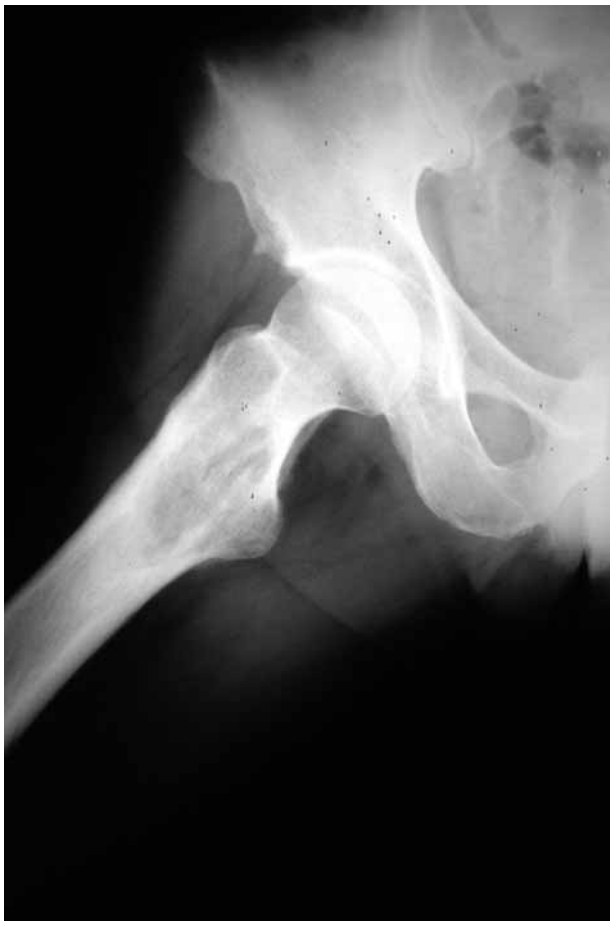

Fig. 1. — A radiograph shows an ill-defined lytic lesion expanding the right proximal femur.

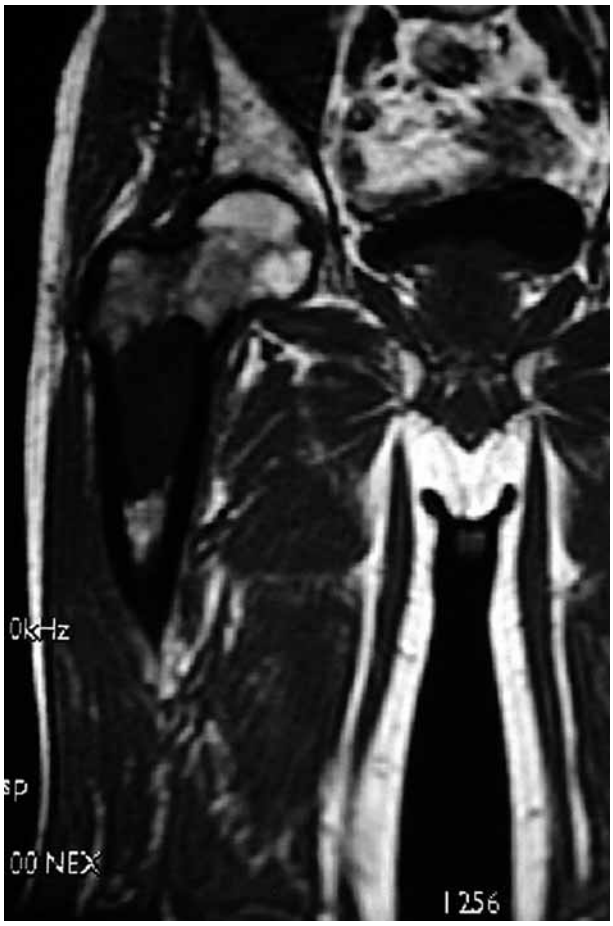

Fig. 2. — An MRI scan shows a lobulated lesion with cartilaginous appearance involving the upper end of the femur.

increased with flexion and abduction of the hip ; it was otherwise unremarkable.

X-ray study showed an ill-defined lytic lesion expanding the right proximal femur with thickening of the cortex and intralesional sclerotic areas (fig 1). Computed tomography (CT) revealed intralesional punctate calcifications and irregular thickening of the cortical bone suggesting permeation. A lobulated lesion with cartilaginous appearance and perilesional soft tissue oedema was observed on magnetic resonance imaging (MRI) (fig 2). The radiologic diagnosis was chondrosarcoma.

In the extension study, a radionuclide bone scintigraphy revealed an intense pathological accumulation at the neck level on the right scapula, in addition to an increased radiotracer uptake in the right proximal femur. An X-ray study revealed a blastic lesion at the level of the right scapula (fig 3) and the CT scan showed a lesion with a calcified matrix and chondroid aspect. There was no radiologic evidence of lung or visceral metastases.

Biopsy of both lesions was performed and, after histological examination, the patient underwent total right scapulectomy. Eight weeks later, an “en bloc” resection of the upper third of the right femur with implantation of a total hip prosthesis was performed, with distal anchorage (Smith & Nephew Orthopaedics GmbH, Tuttlingen, Germany) and a segmental allograft was cemented to the implant (fig 4).

Grossly, the surgical specimen of the entire right scapula measured 20.5 $\times$ 12.5 $\times$ 5 cm and showed

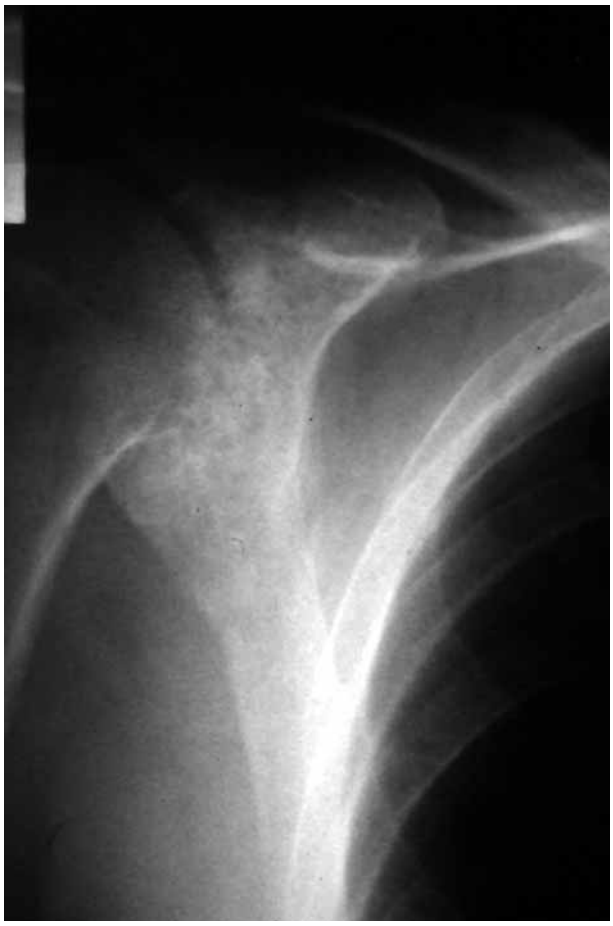

Fig. 3. — A radiograph shows a blastic lesion at the level of the right scapula.

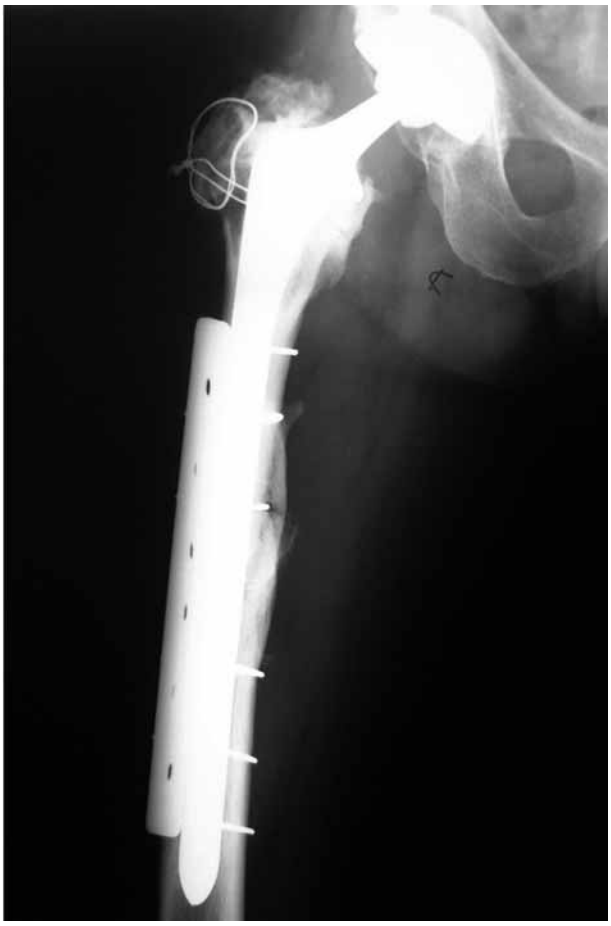

Fig. 4. — A radiograph taken 6 months after surgery

a distorted external appearance, surrounded by soft tissue. On sectioning, the bone was expanded by a tumoral mass, 3.5 cm in its greatest diameter, involving the medullary cavity, permeating through the cortex but with no grossly periscapular soft tissue extension (fig 5). The tumour was firm, ranging from grey to brown in colour and having a faintly translucent blue lobulated pattern. The "en bloc" specimen of the upper third of the femur measured $19.5 \times 11 \times 5$ cm. A sagittal section demonstrated a translucent, blue-grey to white and firm 6.3×2.7 cm cartilaginous mass with lobulated appearance and irregular borders, involving the metaphyseal region of the right proximal femur (figs 6 and 7). The tumour was replacing the marrow space and eroding the cortical bone, but without gross extension into surrounding soft tissue. The tumour was 8 cm from the distal margin of resection.

The biopsy specimen and the subsequent surgical specimen of the right scapula were histologically similar without change in the histologic grade. However, the resected specimen of the right proximal femur revealed a higher grade lesion than the previous biopsy specimen. In summary, both tumours were microscopically conventional grade 2 chondrosarcomas characterised by irregularly shaped lobules of malignant hyaline cartilage permeating the marrow spaces and entrapping preexisting bone trabeculae (fig 8). Invasion through cortical bone was observed, but there was no extension into soft tissues (fig 9). Large areas of myxoid change in the matrix were evident (figs 8 and 10).

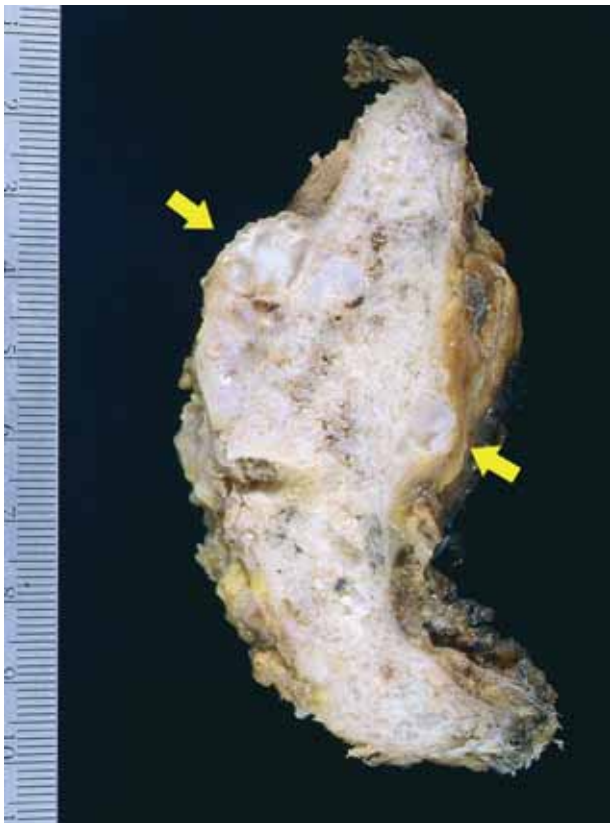

Fig. 5. — Gross specimen of the chondrosarcoma involving the right scapula. The tumour has expanded the involved segment of bone (arrows) although there was no extension into the soft tissues histologically.

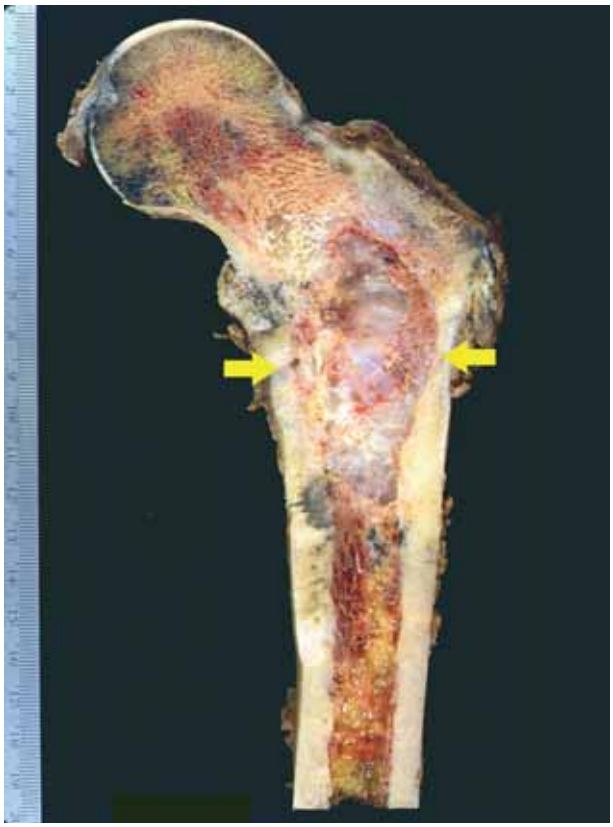

Fig. 6. — Sagittal section of the upper end of the femur demonstrating a poorly circumscribed tumour replacing the marrow space and eroding the cortex (arrows).

After Dorfman and Czerniak "myxoid tumours are classified as grade 2 chondrosarcomas, even when the cellularity of the lesion is relatively low (i.e. similar to that of grade 1 chondrosarcoma)" (*9*). The cellularity was moderately increased, and the neoplastic chondrocytes showed moderate enlargement, hyperchromasia and pleomorphism of the nuclei. Double nucleation and mitotic figures were also occasionally found (figs 10 and 11).

Three years and a half after the last surgery, the patient presents limitation of shoulder mobility and walks without external aid, and has no evidence of local recurrence or metastatic lesions.

DISCUSSION

Multicentric presentation for skeletal sarcomas is a rare occurrence which has been previously described in the literature (*10, 15, 20*). Multicentricity refers to the development of multiple skeletal malignancies in either a simultaneous or sequential fashion, in the absence of visceral involvement. With regard to chondrosarcomas, multicentricity is extremely unusual, especially in the non-mesenchymal variants (*18*). In our case, this condition was demonstrated by the simultaneous presentation of two non-contiguous chondrosarcomas, one originated in the metaphyseal region of the right femur and the other in the right scapula, without evidence of metastases. Among 92 cases of non-mesenchymal chondrosarcoma codified in the files of the Pathology Department of the "12 de Octubre Hospital" from 1976 through 2002, the case we report here is the unique example of MC. In a review of the literature, Damron *et al* (*7*) only found 6 reported cases of multicentric chondrosarcoma

Fig. 7. — High-power view of figure 6. The tumour is composed of hyaline cartilage and shows poorly demarcated limits.

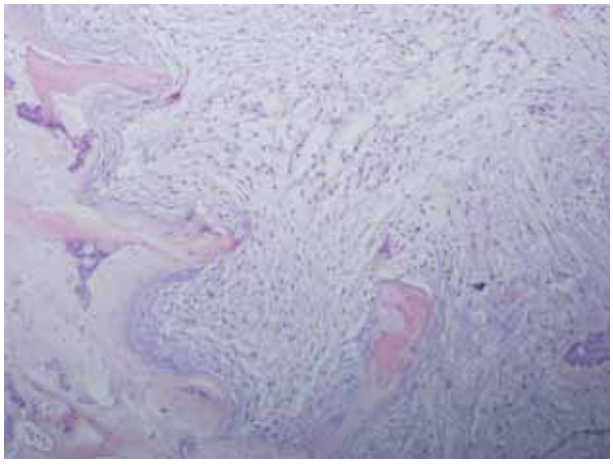

Fig. 8. — Low-power appearance of grade II chondrosarcoma of the scapula showing permeation between preexisting bone trabeculae and extension into the adjacent marrow space. Myxoid quality of the matrix is evident.

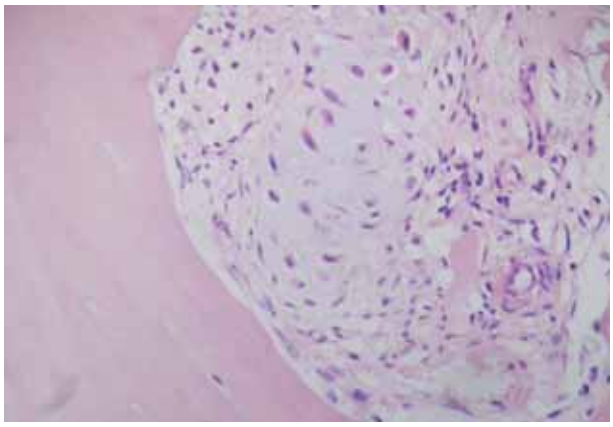

Fig. 9. — Pathologic specimen from the scapula. High-power view showing lobules of cartilage with moderate cytologic atypia infiltrating the cortex.

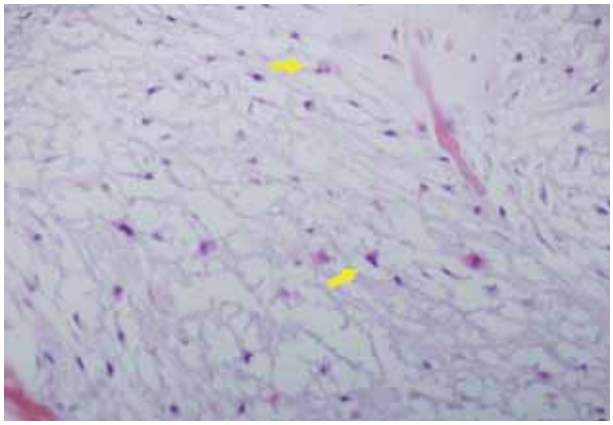

Fig. 10. — Grade II chondrosarcoma involving the femur. Myxoid change of the matrix and several doubly nucleated cells are shown in this field.

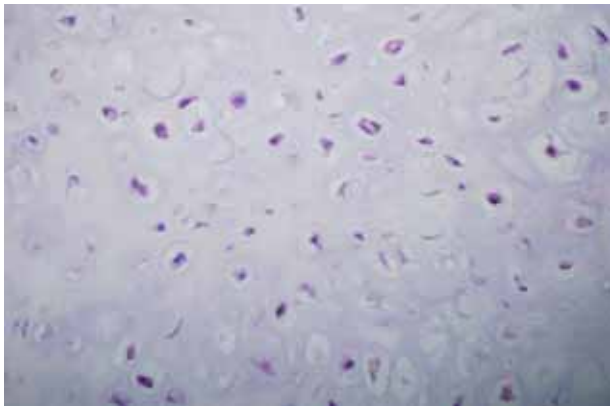

Fig. 11. — Histological specimen from the tumour of the femur. There is moderate nuclear pleomorphism and increased cellularity, characteristic of grade II chondrosarcoma.

other than those from mesenchymal chondrosarcoma (*3-7, 12, 14*), to which they added 8 further cases from the Mayo Clinic files. Of these 14 patients, 7 had multicentric chondrosarcomas arising centrally in a previously normal bone (primary chondrosarcomas) and the remaining 7 had multicentric chondrosarcomas arising in a benign precursor (secondary chondrosarcomas), 5 of them in association with Ollier's disease (2 limited to the hand), and 2 with Maffuci's syndrome. Eight patients had involvement within the same limb (monomelic) and 6 had involvement either in more than one limb or in sites other than the extremities (non-monomelic). Among the monomelic cases, six had tumours present at the time of initial diagnosis of multicentric chondrosarcoma (synchronous) and in the remaining two cases the tumours presented at different times (metachronous). All non-monomelic cases occurred metachronously. In 1998, Ozaki *et al* (*19*) reported for the first time the case of a 71-year-old patient with two synchronous chondrosarcomas derived from multiple cartilaginous exostoses. One chondrosarcoma originated in the left pubic bone and the other in the posterior aspect of the greater trochanter of the left femur. To the best of our knowledge, our patient is the first case of non-monomelic synchronous MC arising in two previously normal bones of the skeleton.

Other reported patients with multiple chondrosarcomas (*2, 8, 17*) have been considered to suffer from metastatic disease rather than multicentricity, based on the presence of an initial dominant focus of bone involvement, the predilection for multiple sites commonly associated with metastatic spread such as the axial skeleton (vertebral column, pelvis, ribs, skull) and proximal long bones, and the long latency period between the original tumour and the secondary lesions in most cases (*8*).

Several reports in the literature have described the results after reconstruction with the use of an allograft-prosthesis composite (*1, 13, 16, 21*). In the largest one, Mankin *et al* (*16*) reported 98 patients who were managed with an allograft and followed for at least two years. Seventy-six patients (78%) had a good or excellent result according to the scoring system of those authors. In a comparison of 17 patients managed with 18 megaprostheses and 16 patients managed with 18 composites following resection of the proximal part of the femur, Zehr *et al* (*21*) found no significant differences in clinical function or in the longevity of the reconstructions. The most common complication in the group managed with the megaprosthesis was instability, which occurred in five patients (28%). Deep infection developed around three composite reconstructions, necessitating an amputation in two patients ; only one infection occurred in the megaprosthesis group. Anract *et al* (*1*) reviewed the cases of 21 patients who were managed with an allograft-prosthesis composite and 20 who were managed with a megaprosthesis in the proximal part of the femur. Function appeared to be better in the patients managed with the composite, and there was a tendency toward an increased survival rate at ten years.

Of 718 allograft procedures in the study by Mankin *et al* (*16*), 156 failed. The most common complications in the series were fracture (19%), non-union (17%), infection (11%), and instability (6%). Infection was the most common cause of a failed allograft, with 43% of the failures caused by infection. Most failures occurred during the first three years, with the greatest incidence during the first year after implantation.

In summary, we believe we report for the first time a patient with two non-monomelic synchronous multicentric chondrosarcomas arising in two previously normal bones of the skeleton. There is no evidence of recurrence or metastatic lesions nor of any complication after reconstruction with the use of an allograft-prosthesis composite three years and a half after surgery.

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