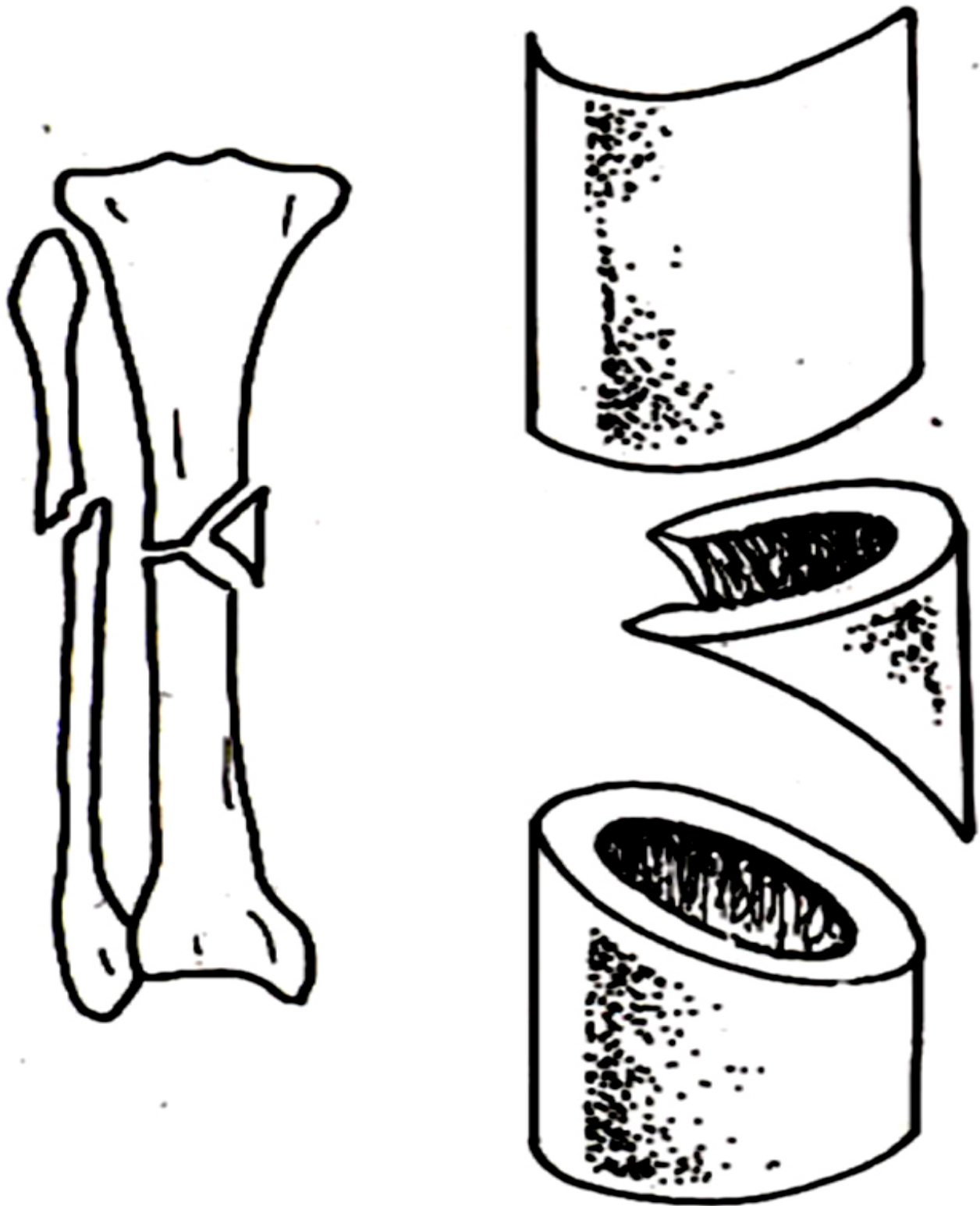


# THE RING BUTTERFLY FRAGMENT

Pages with reference to book, From 80 To 82

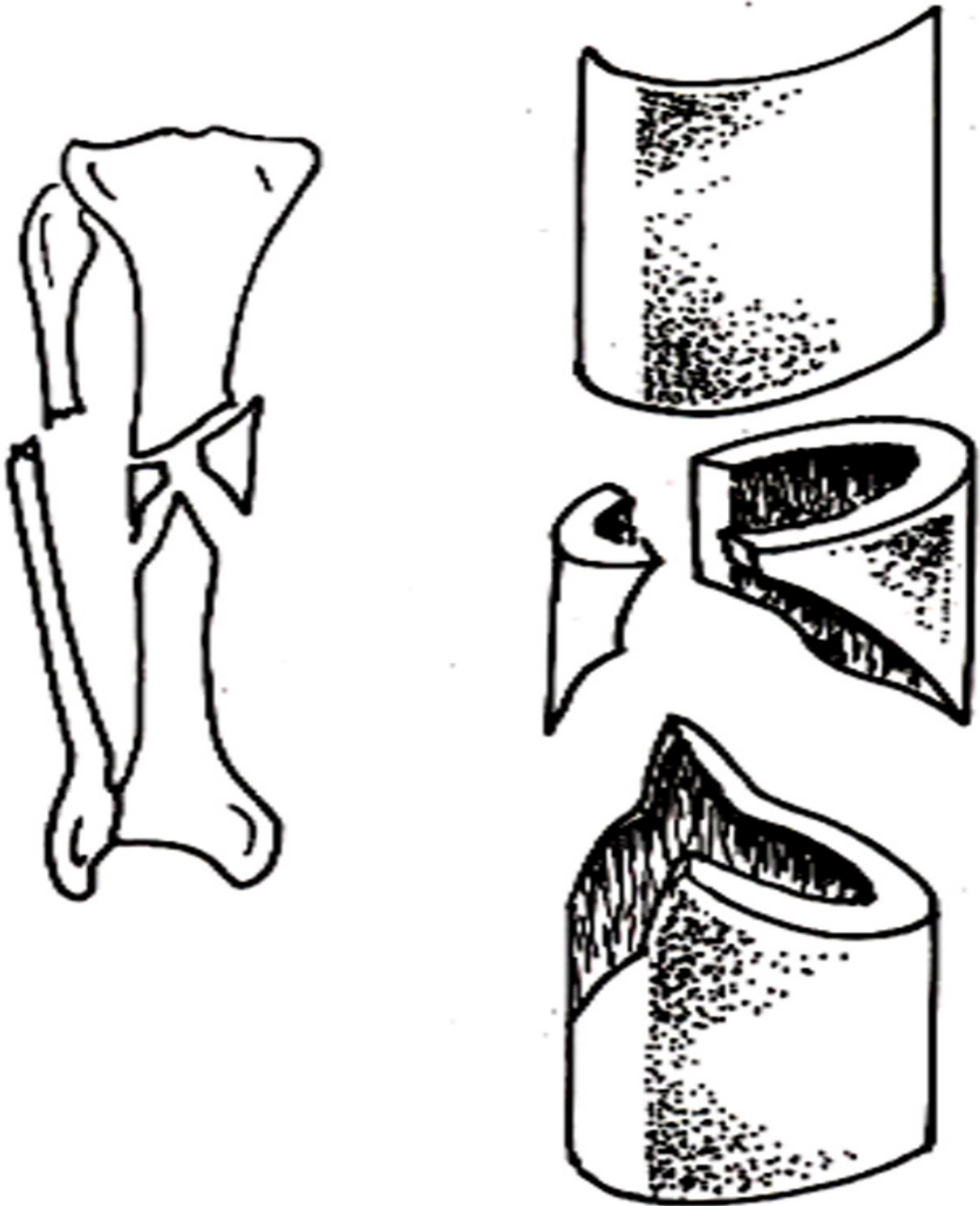
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In long bone fractures, comminution of fracture fragments adds an additional dimension to be considered in fracture management. Whereas smaller comminutions can be disregarded, larger pieces may contribute to the stability of the fracture and must be attended to in the planning and execution of surgery to stabilize the fracture. One such comminution is a triangular fragment called “butterfly” fragment by the Orthopaedic Trauma Association<sup>1</sup> or the “wedge” fracture by the AO group<sup>2</sup>. It may be unicortical or bicortical depending on whether its dimensions incorporate more than or less than 50% of the circumference of the bone at the fracture site (Figures 1 -A and 1-B).



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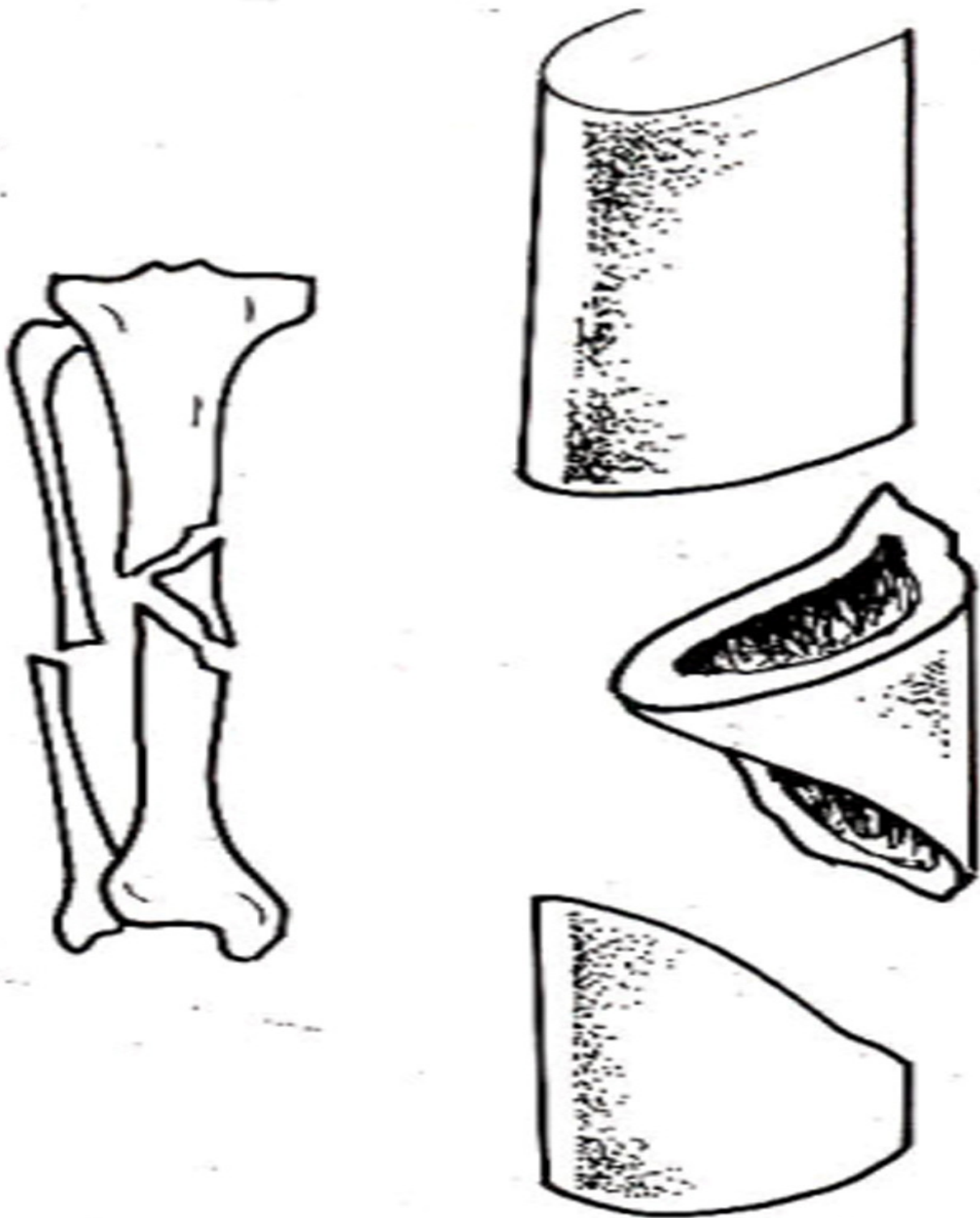
**Figure 1-A. Unicortical comminution.**



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**Figure 1-B. Bicortical comminution.**

The objective of this case presentation is to report on an unusual variation of the butterfly fracture - "the ring. butterfly fragment" (Figure 2)



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**Figure 2. Ring butterfly fragment.**

and to call attention to the need for its correct recognition and management during flexible intramedullary nailing.

## **CASE REPORT**

A 21 years old male was going on a scooter when lie was hit by a car and sustained a closed injury of the right leg. X-rays showed a mid-shaft fracture of the right tibia with a butterfly segment. There was also a fracture of the fibula just below the level of the tibial fracture. Overlap of the fracture fragments gave the impression of a unicortical butterfly fragment (Figure 3-x-ray).

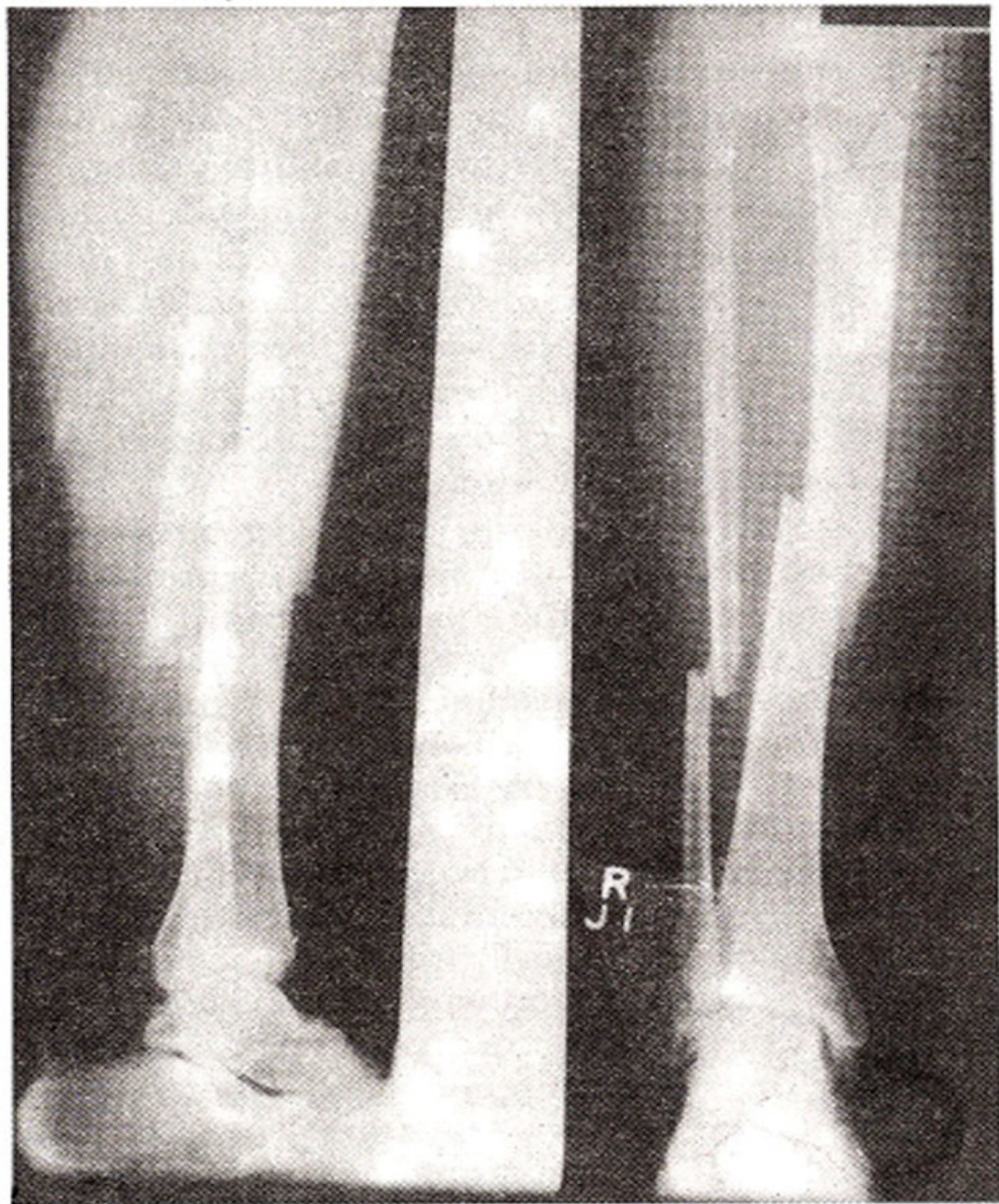


Figure 3. X-rays of the right leg showing the comminuted fracture of the midshaft of the tibia and fibula.

The fracture configuration was unstable with postero-medial displacement. Closed non-reamed intramedullary fixation with flexible (ender) nails was planned. During surgery the first nail was passed in an antegrade manner across the fracture site. It was well positioned inside the medullary cavity of the major fragments in both antero-posterior and lateral views, but the triangular comminuted fragment which was originally considered a unicortical butterfly fragment had now displaced antero-medially. This displacement made possible its correct identification as a typical ring butterfly segment. The nail had passed behind the ring fragment displacing it and preventing its subsequent reduction (Figure 4-A).

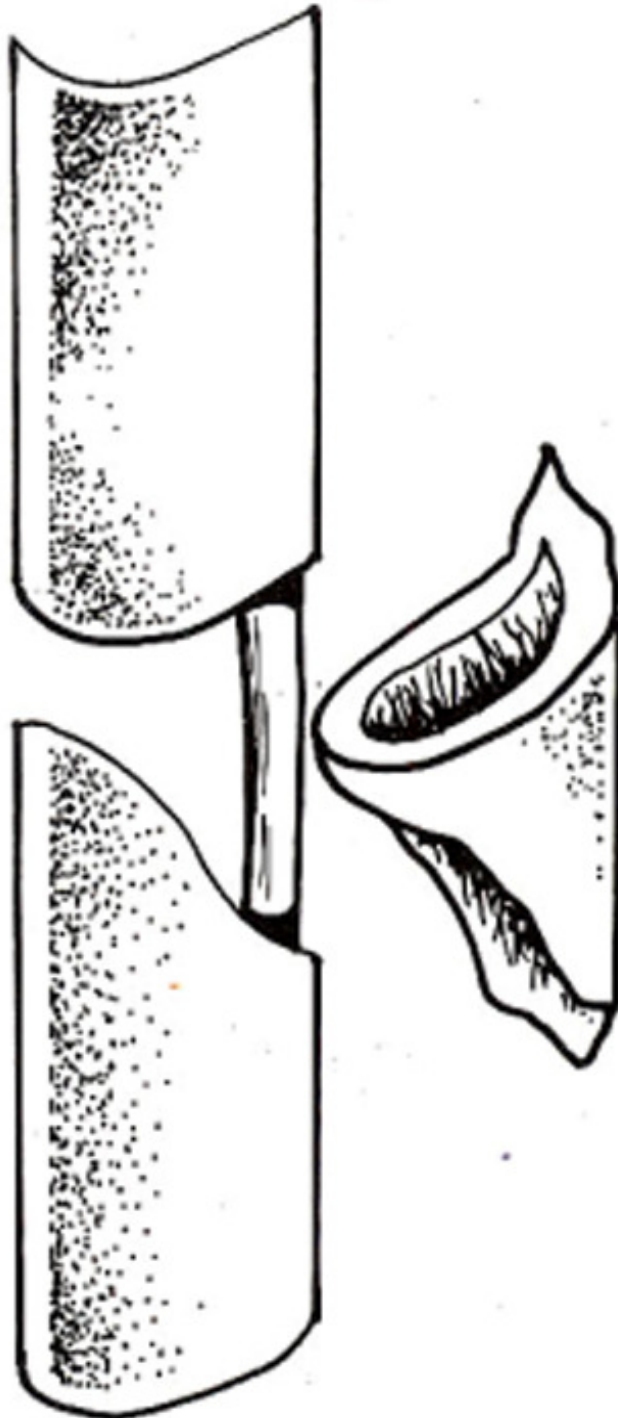


Figure 4-A. The ring butterfly fragment displaced upon insertion of the first nail.

The nail was withdrawn and re-inserted with simultaneous external pressure over the ring fragment holding it reduced in its place until the nail was guided through. A second nail was then passed easily. Check x-rays confirmed satisfactory reduction of the ring fragment with both nails passing through it (Figure 4-B).



**Figure 4-B. The reduced ring butterfly fragment following insertion of Ender nails.**

The fracture was stable enough for the patient to ambulate with full weight on the right leg on the 4th

postoperative day (Figure 5- x- ray).

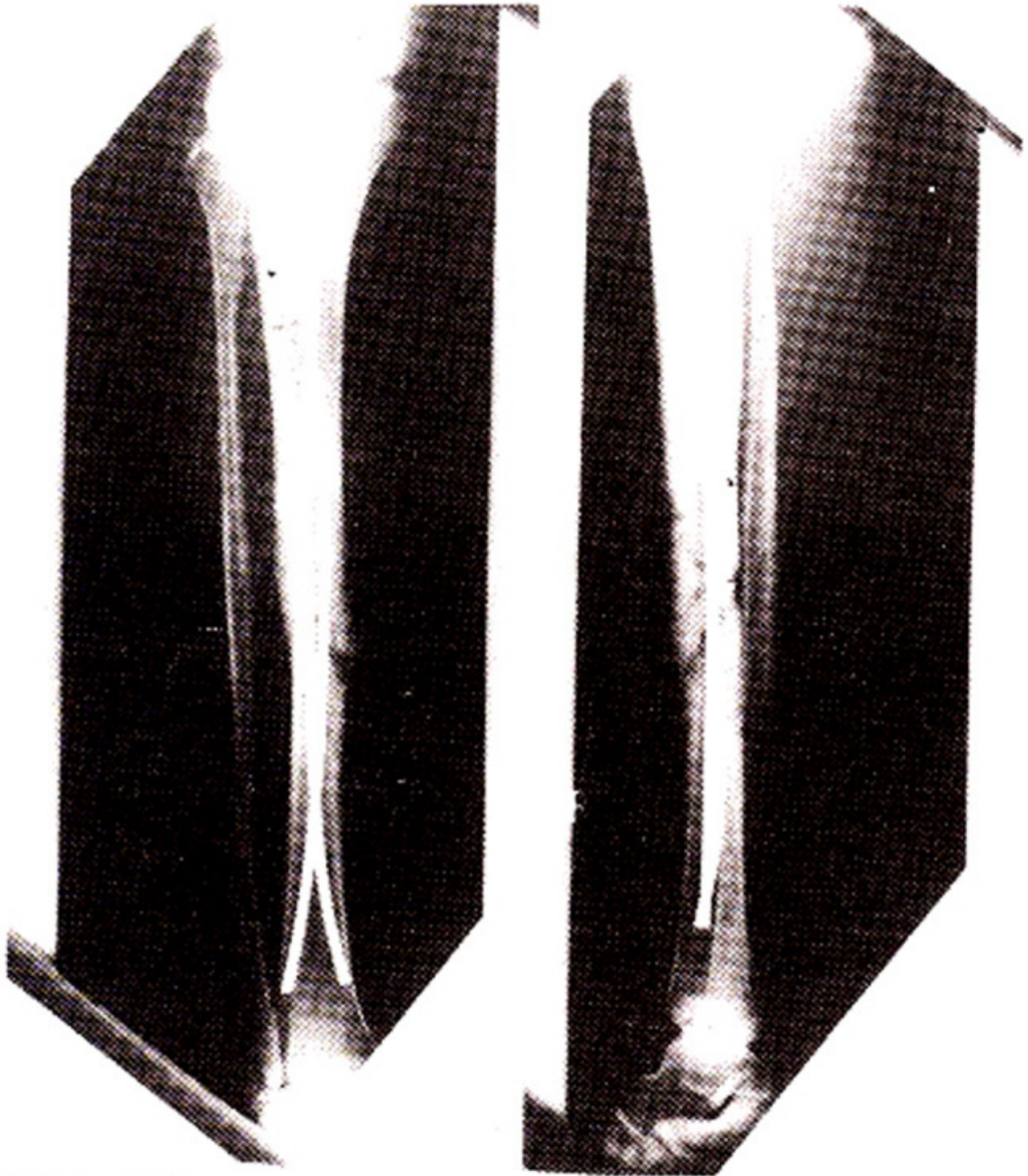


Figure 5. X-rays after reduction and internal fixation of the tibial fracture and its ring butterfly fragment.

## DISCUSSION

The butterfly fracture is a fairly common entity and well recognised in fracture management<sup>2,3</sup>. Advocates of the AO technique of internal fixation<sup>2</sup> advise inter-fragmentary compression screw fixation at each fracture interface. This applies equally to the unicortical/bicortical butterfly fractures as well as the ring butterfly fragment. Since anatomical reduction is essential to the AO technique of internal fixation, the variations of butterfly fragment configuration are not of any significance. However, Muller et al<sup>2</sup> acknowledge the precariousness of the blood supply of this fragment and recommend bone grafting of all areas of cortex suspected of having become devitalized - an all too frequent occurrence during open reduction procedures. In view of this, Pankovich et al<sup>3</sup> have proposed closed intra-medullary nailing wherein the soft tissue envelope is not disturbed as much as in open reduction and plating. Another factor to be considered in the choice of management of this fracture type is its contribution to the overall stability of the fractured bone. A unicortical fracture configuration is stable after fixation with flexible intramedullary nails but a bicortical butterfly segment represents an unstable configuration and requires additional supplemental stabilization<sup>4</sup>. Such a fracture is best treated by a locked intramedullary nail system such as the Grosse Kempf nail<sup>5</sup>. The ring butterfly fragment is a newly described entity. Its occurrence is far less frequent than the unicortical/bicortical butterfly comminution, but few reports describe it as separate from the others. Rush<sup>6</sup> described it in his treatise on Rush pin techniques but no mention was made of its clinical significance. Pankovich et al<sup>7</sup> reporting on 8 cases described their difficulties in passing Ender nails through the ring of the fragment. Our experience with this reported case reinforces the need for special attention to this fracture. This segment is a large cortical fragment. It is triangular and has a narrow ring of bone that contains the entire circumference of the medullary canal. Thus the ring butterfly fragment converts a simple fracture into a segmental one making it unstable. Care has to be taken to identify this fragment because failure to recognise it at the time of closed intramedullary fixation may cause the nail to pass behind the fragment and lead to its further displacement, as occurred in our case. It is important to thread the flexible intramedullary nails through the medullary ring of the butterfly fragment because unlike the unicortical comminution which can be compressed into place by external pressure even after intramedullary fixation, the 'ring' element (complete circumference) of this fragment prevents such reduction. The importance of such a reduction by transfixing the ring fragment was identified by Pankovich<sup>3</sup>. He reported 2 cases in which failure to identify and incorporate the ring fragment into the fixation by the intra-medullary nails lead to nonunion of the fracture. Eventually open reduction and bone grafting had to be done. The incorporation of the ring butterfly segment provides continuity of the cortex circumferentially. When reduced, it is wedged between the ends of the main fracture fragments and converts an unstable fracture into a remarkably stable one permitting even weight bearing. This serves to further compress the fracture fragments and thereby stimulate bone healing and a quicker functional recovery. Orthopaedic surgeons who undertake Ender nailing of long bone fractures should be cognizant of the ring butterfly fragment and take appropriate measures to thread the nails through the ring (medullary cavity) of it in order to achieve minimum stability of such fractures.

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