

Anatomical Note

A congenital abnormality of the tibial tuberosity representing the evolution of traction epiphyses

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INTRODUCTION

Anatomists have long sought to demonstrate that traction epiphyses are phylogenetically derived from sesamoid bones. Parsons (1908) surmised that: "When a sesamoid structure in a tendon is caused by the pressure of a bone into which the tendon is on its way to be attached, without the intervention of a fleshy belly, it fuses with that bone and a traction epiphysis results".

Reviews of the comparative anatomy of the knees of mammals, birds and reptiles have attempted to prove this hypothesis (Lewis, 1958; Barnett & Lewis, 1958).

We describe a congenital abnormality of the traction epiphysis of the upper tibia which supports the above hypothesis and appears to represent an evolutionary relic.

REPORT

A 52 year old man presented, complaining of painful lumps on both knees. Clinically the lumps lay within the ligamenta patellae and were symmetrical. Lateral radiographs of both knees are shown in Figures 1 and 2. He remembers the lumps being present in early childhood, prior to his adolescence.

The lesions were excised and were found to consist of well-corticated bony masses, lying within the ligamenta patellae and articulating with the upper tibiae. The deep surfaces of the ossicles were lined with articular cartilage.

DISCUSSION

At first sight the radiological appearances shown in Figure 1 are unremarkable. Similar appearances can occur after long standing Osgood Schlatter's disease and this was our pre-operative diagnosis. Moreover, a sesamoid bone within the ligamentum patellae is a known radiological finding. However, the presence of articular cartilage on the under surface of the ossicles and the fact that the history of the lesions predates the patient's adolescence gives far more significance to these lesions.

Figure 3 represents the presumed evolution of the tibial tuberosity from an accessory sesamoid bone lying within the ligamentum patellae as described by Lewis

* After this paper had been submitted for publication Mr. G. R. Houghton was tragically killed in a traffic accident.

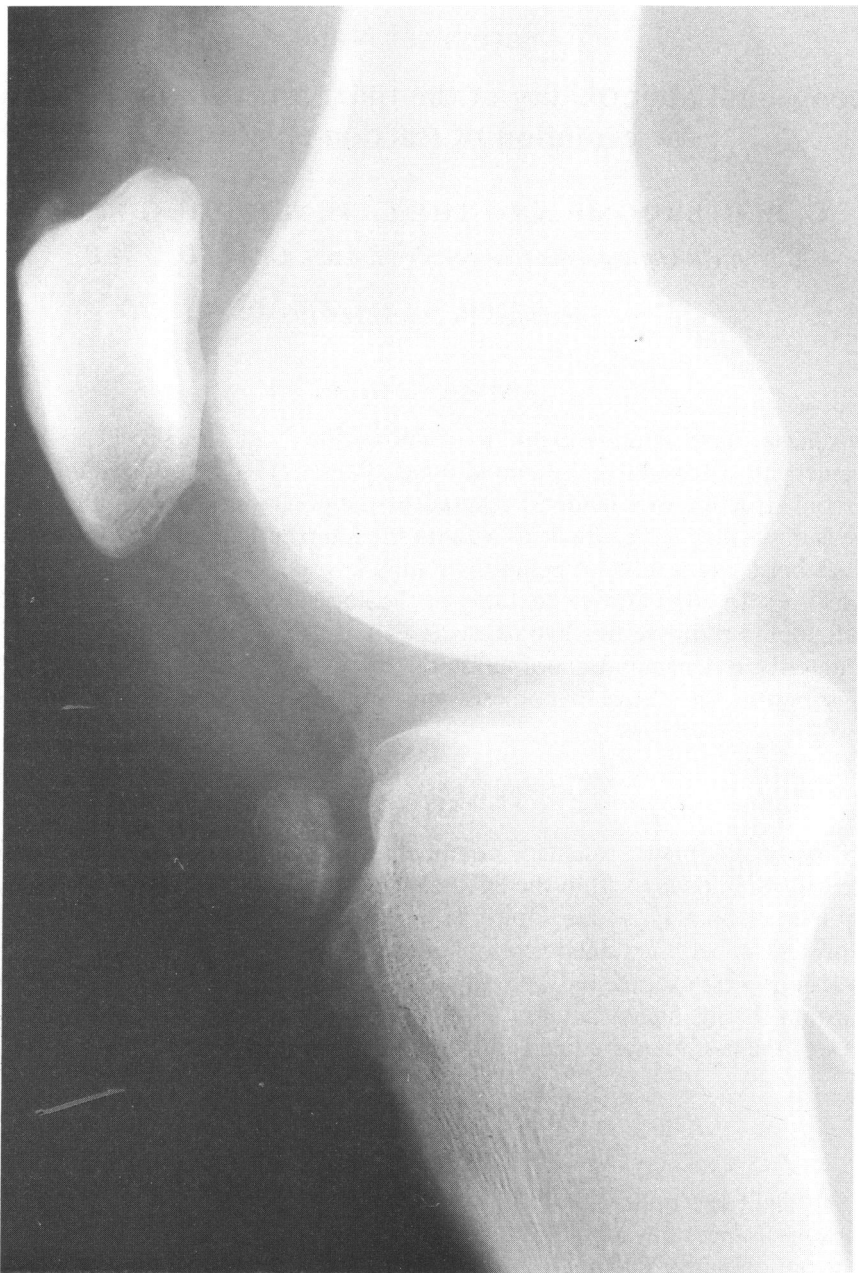


Fig. 1. Lateral radiograph of left knee.

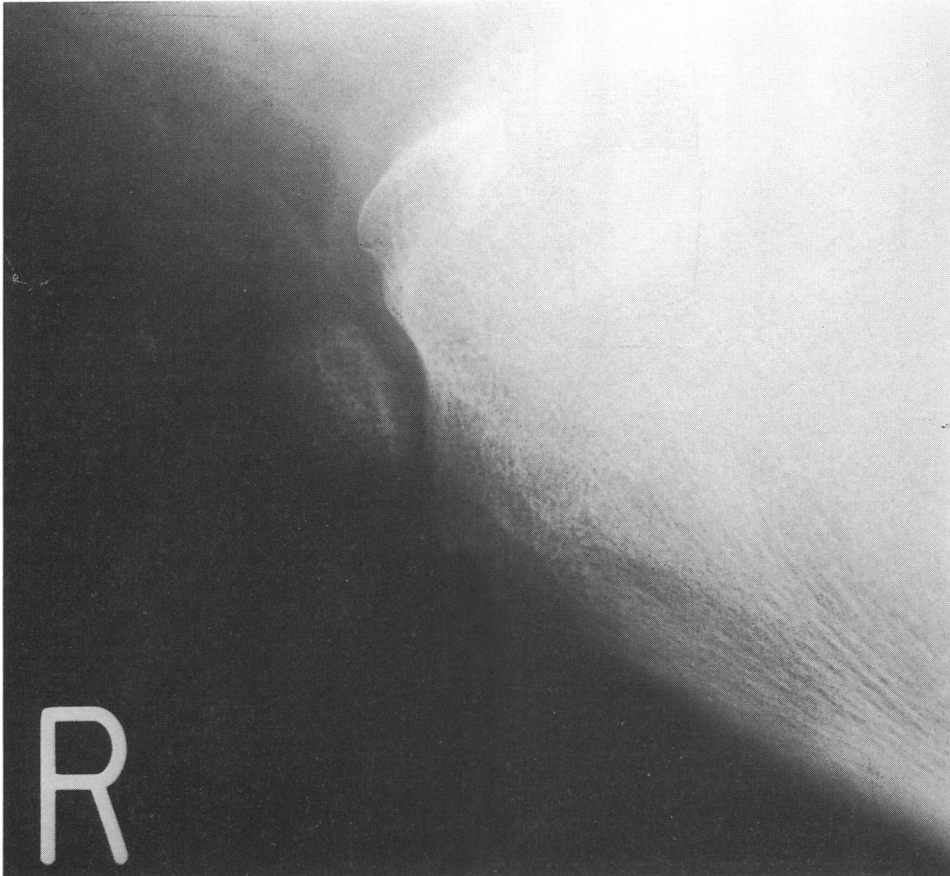


Fig. 2. Lateral radiograph of upper right tibia.

(1958). Figure 3 (I) represents the knee of a full term fetus where the ossification site of the tibial tuberosity is derived from an anterior tongue of cartilage extending from the compression epiphysis of the upper tibia. Figure 3 (II) represents the knee of the pouch embryo of the black-tailed wallaby, *Macropus ualabatus*. In this species the tuberosity occurs as a separate ossification centre, lying anterior to the upper tibial epiphysis, but is not separated from it by surfaces lined with articular cartilage. Figure 3 (III) is described by Lewis (1958) as representing the phylogenetically most primitive stage, where the tuberosity is represented by a sesamoid bone, lying with a ligamentum patellae and lined with articular cartilage on its deep surface. Lewis was unable to find a true-life example of this stage in his study of comparative anatomy, although there are similarities to the knee of the lizard, *Uromastix spinifer*.

SUMMARY

We believe that our case demonstrates a congenital abnormality which represents the stage in evolution that Lewis described in his 'hypothetical mammal'. This adds support to Parson's theory that traction epiphyses are derived from sesamoid bones.

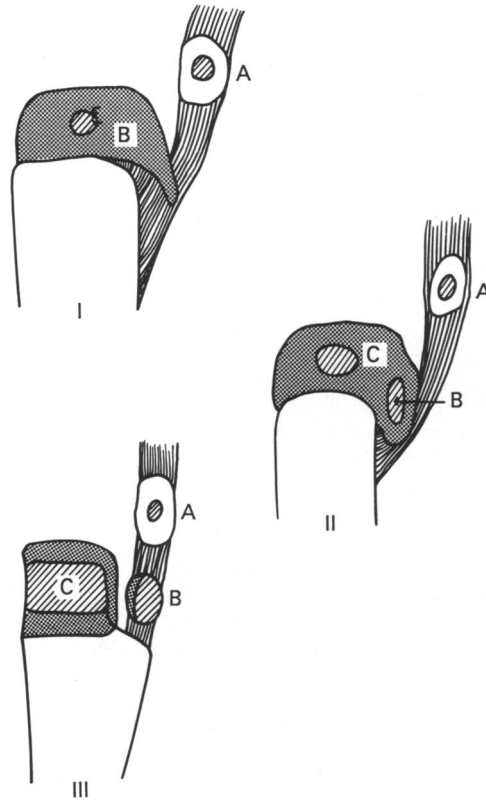


Fig. 3. Presumed evolution of tibial tuberosity from an accessory sesamoid bone. See text for description. I, Full term human fetus; II, pouch embryo of the black tailed wallaby; III, hypothetical primitive mammal similar to the pattern in our patient. A, Patella; B, tibial tubercle; C, ossification centre of upper tibial compression epiphysis.

REFERENCES

- BARNETT, C. H. & LEWIS, O. J. (1958). The evolution of some traction epiphyses in birds and mammals. *Journal of Anatomy* **92**, 593–601.
- LEWIS, O. J. (1958). The tubercle of the tibia. *Journal of Anatomy* **92**, 587–592.
- PARSONS, F. G. (1908). Further remarks on traction epiphyses. *Journal of Anatomy* **42**, 388–396.