OSTEOCHONDRTIS DISSECSANS is frequently seen in man and dogs. It was first described in man by Sir James Paget (1870) and was called Osteochondritis dissecans by König (1888). In man most lesions occur on the lateral aspect of the medial femoral condyle (Green, 1966) but may also involve the elbow, ankle and hip joint.

In dogs the lesion most frequently develops in the central area of the caudal aspect of the head of the humerus and is seen in the larger breeds. (Pobisch, 1962; Craig and Riser, 1965; Mostosky, 1966; Vaughan and Jones, 1968; Campbell, 1968; and Griffiths, 1968). A less common site is the stifle joint (Robins, 1970).

In the horse some cases have been described affecting the stifle joint (Van Pelt, Riley and Tillotson, 1970) and in our opinion some of the cases with "intra-capsular bony fragments of the distal tibia" described by Birkeland and Haakenstad (1968) were characteristic of osteochondritis dissecans.

In man the condition is characterised by the separation of a fragment of subchondral bone, with its attached articular cartilage from a convex articular surface.

The aetiology of osteochondritis dissecans is unknown, but a number of factors can be considered. It is difficult to substantiate the ischaemic theory, which postulates an interruption of the blood supply to an area of subchondral bone without an accompanying fracture through the subchondral bone. Although Bahdi (1951) and Burrow (1959) consider a subchondral fracture to be the primary cause, evidence of trauma is not always present.

Experiments with very young dogs by Langenskiöld (1955) and Tallquist (1962) suggest that osteochondritis dissecans could result from a fracture of the cartilage followed by its separation together with a fragment of bone. This theory does not explain the defects seen deep in the subchondral bone.

Smillie (1960) considered that osteochondritis dissecans might be caused by a small fragment separating from the centre of ossification and followed by an ischaemic

Fig. 1. Osteochondritis dissecans of the dorsal edge of the sagittal ridge of the tibia.

Fig. 2. Osteochondritis dissecans of the dorsal edge of the sagittal ridge of tibia and lateral ridge of tibiotalar bone.
necrosis due to its poor blood supply.

The probable cause appears to be a constitutional disturbance associated with other factors, especially trauma (Stillman, 1966). This constitutional disturbance could be an inherited factor, and, in man familial cases have been described (Gardiner, 1955; Tobin, 1957; Stougaard, 1961; Stougaard, 1964).

MATERIALS AND METHODS

During the last two years osteochondritis dissecans of the tibio-tarsal joint has been diagnosed in 28 horses. They comprised 14 stallions, four geldings and 10 mares, of which two were Thoroughbreds, 22 Standardbred trotters and four Standardbred riding horses, of which 18 were seven months to two years old, five were three years, three were four years, one was five years and one seven years old. Four of the horses were not lame, 14 moved stiffly with reduced flexion of the hock joint at the trot and 10 were slightly but permanently lame.

The "spavin test" was positive in 12 out of 20 horses tested, there being four bilateral and eight unilateral cases. Twenty-six of the horses had obvious excesses of synovial fluid in a tibio-tarsal joint, 14 being bilateral and 12 unilateral. Five of the latter cases were affected with bilateral osteochondritis dissecans.

RADIOGRAPHIC FEATURES

Usually four radiographs were taken of each tarsal joint and the most useful information was obtained from the craniolateral-caudomedial (70°) and caudolateral-cranioomedial (115°) projections. In three of the horses only the clinically affected tarsal joint was radiographed but of the 25 horses in which bilateral radiographs were taken 17 showed bilateral osteochondritis dissecans. The localisation of the osteochondritis dissecans lesion in 46 affected tibio-tarsal joints of 28 horses was as follows:

(a) Dorsal edge of sagittal ridge, 36 cases (fig. 1).
(b) Malleolus medialis, five cases.
(c) Dorsal edge of sagittal ridge and malleolus medialis, three cases.
(d) Dorsal edge of sagittal ridge and lateral ridge of tibio-tarsal bone, two cases (fig. 2).

Radiologically, the lesion appears as a crater-like zone of rarefaction with separation of a subchondral bone fragment or fragments. In 13 of the affected joints other lesions were seen, such as a slight to severe arthrosis, joint mice and a tibial subchondral bone cyst.

SYNOVIAL FLUID EXAMINATION

Samples of synovial fluid were obtained from the tibio-tarsal joint at operation and at 8 and 14 days post operation. Details of the examinations carried out and the results are given in the Table. The results obtained were within normal limits except for the following which were revealed by statistical analysis.

(i) Glutamic oxaloacetic transaminase activity
(a) Very significantly higher (P<0.01) 8 days after operation than at operation.
(b) Significantly higher (P<0.05) 14 days after operation than at operation.
(c) Significantly higher (P<0.05) 8 days after operation than at 14 days.

(ii) Total protein
(a) Significantly higher (P<0.05) 8 and 14 days after operation than at operation.
Fig. 3. Types of tissue in the fragments: cartilage, bone and connective tissue.

(b) Significantly higher (P<0.05) 8 days after operation than at 14 days.

(iii) Phosphorus
Significantly higher (P<0.05) at operation than at either 8 or 14 days after operation.

HISTOPATHOLOGY
Twenty-four fragments removed from 16 joints were examined histologically. The majority were biconvex, 7 to 18 mm. long and up to 5 mm. thick. The articular surfaces were smooth, and the under surfaces porous and fibrous. The specimens were fixed in a formol-saline solution, decalcified in either 6 per cent HNO₃ or 5 per cent EDTA, embedded in paraplast, 5 μ sections cut and stained with either Haematoxylin-eosin, Van Gieson, Toluidin blue or Alcian blue—P.A.S.

In order to study the deposition of fluorescent zone of bone in the specimens, six horses received 8 mg./Kg. oxytetracycline by intra-venous injection 48 hours before operation, and the slides were examined with a fluorescence-microscope (absorption maximum of oxytetracycline: 365mµ).

Microscopically the specimens are seen to comprise three types of tissue, cartilage, bone and connective tissue (fig. 3). The cartilage was characteristic of articular cartilage with columnar arrangement of the chondrocytes, and in all specimens a zone of calcification was present. Local degenerative changes included vacuolisation, fibrillosis and splitting due to haemorrhage (fig. 4).

The bone was mostly lamellar and haemorrhages of varying ages were present. Necrosis, although infrequently seen was always in the vicinity of haemorrhages. A number of foci of fibro-cartilage containing young fibroblasts were present, and in nearly all cases fibrillosis and sometimes fibrosis was a prominent feature of the bone marrow. A fluorescence was seen in the bony tissues of the specimens obtained from the horses injected with oxytetracycline.

TREATMENT
In children, unless the fragment has separated, good results are obtained by immobilizing the joint coupled with rest for several months (Green and Banks, 1953; Green, 1966). In older patients the fragment can be fixed in position with a pin, but a more simple method which gives equally good results is to remove the fragment and curette the cavity (DeForest Smith, 1960). The cavity is not cured if the fragment has separated and is lined with fibrocartilage. In the dog, Birkeland, (1967); Griffith, (1968), and Clayton-Jones and Vaughan, (1970) found that better results were obtained by surgical treatment than by conservative methods, the former cases recovering in about three months.

Conservative
Two horses received no treatment, and eight were rested and received intra-articular injections of corticoids together with mineral supplements, vitamin D and anabolic steroids. Two horses became sound following conservative treatment and raced successfully after one year. Four horses remained lame with an hydromarthrosis which persisted for several months after treatment. One horse was destroyed after six weeks and another died from an incarcerated inguinal hernia after six months. The fragments in this case had not united (fig. 5).

Surgical
Eighteen horses, comprising 11 unilateral and seven bilateral cases, have been treated surgically. In five of the horses with bilateral osteochondritis dissecans only the clinically affected joint was treated. Otherwise,
both joints were operated upon at the same time.

The operation is performed under general anaesthesia. The horse is placed in lateral recumbency with the affected leg uppermost and secured in a slightly flexed position.

A skin incision is made parallel and lateral to the tendon of the long digital extensor muscle from 3 cms. proximal to 5 cms. distal to the malleolus. The superficial and deep fascia are incised taking care to avoid the peroneus superficialis nerve. The tibialis cranialis vein is dissected free, any small lateral branches are ligated (fig. 6), and then the tendon of the long digital extensor is retracted medially. At this stage of the operation it is generally possible to palpate the separated fragment on the dorsal aspect of the ridge of the coxal tubiae through the joint capsule.* Next, the joint capsule is incised just lateral to the separated fragment: in some cases this was followed by hypertrophic synovial villi protruding through the wound.

If the fragments are loose they are easily removed with forceps (fig. 7), but if the cartilage or the short lateral ligament is intact or fibrous adhesions are present, the fragment must be detached with a bone chisel or meniscotome. If the defect is not lined by fibrocartilage it is curetted until healthy subchondral bone is exposed (fig. 8). In one case three fragments had separated and were free in the joint.

Before closing the incision the joint is irrigated with physiological saline solution and an antibiotic is instilled. The joint capsule is closed in two layers: the synovial layer with interrupted mattress sutures using 3/0 or 4/0 silk and the fibrous layer with a continuous suture using 4/0 silk.

After suturing the fascia and skin the joint is protected with cotton wool and an elastic bandage. These dressings are removed after eight days in order to inspect the wound, and to aspirate any excess synovial fluid and inject 25 mg. of prednisolone†. The joint is kept bandaged for three weeks and the horse rested for six months.

Results

The results of surgery cannot be assessed accurately as few of the cases have returned to training. Seven horses which have been observed for three months after operation have had a partial or complete regression of the hydroarthrosis. Seven cases more recently operated upon have made satisfactory post operational progress without untoward complications.

One horse which had received intra-articular injections of methylprednisolone at intervals for several months prior to operation developed an acute peri- and intra-articular inflammation accompanied by diffuse oedema. This complication might have been due to the corticoid injections (Farquharson, 1966). Lameness has persisted, and the animal is now used as a brood mare.

Another horse fractured its femur during the recovery phase following the operation, and was destroyed. One horse still has an hydroarthrosis with slight lameness some three months after operation but recent radiographs show no evidence of a lesion. One other horse which was operated upon bilaterally, has returned successfully to racing and has remained sound and free from hydroarthrosis.

Discussion

In man and in the dog osteochondritis dissecans is more frequent in the young male (Birkeland, 1967; Vaughan and Jones, 1968; Griffiths, 1968; Clayton-Jones and Vaughan, 1970; De Angelis, 1970). We noted the same tendency in the horse, the Standardbred trotter being particularly susceptible. Macroscopic and histological examinations of our specimens showed a closer resemblance to osteochondritis dissecans as described in man, than that in the dog. In the dog Cordy and Wind (1962), and Craig and Riser (1965) found that most fragments consisted only of cartilage.

Cordy and Wind noted that the separation occurred along the line of calcification of the cartilage, and they therefore questioned the correctness of the term osteochondritis dissecans when applied to the dog.

Craig and Riser (1965), only found bone tissue in specimens which were still attached by connective tissue and they considered it had formed by endochondral ossification. They also stated that separation occurs at the line of junction between cartilage and bone, and considered the subchondral defect to be the primary change.

Our specimens from the tibio-tarsal joints of horses clearly indicated that the separation, as in man, takes place in the subchondral bone. The separation was

* If the osteochondritis dissecans involves the medial malleolus then the skin incision is made on the mediodorsal aspect of the tibio-tarsal joint exactly over the detached fragment.

† Vecortenol, CIBA.
accompanied by haemorrhage but bone necrosis was not as common a feature as in man.

In the horse small defects may heal spontaneously. For large or loose fragments removal and curettage of the cavity appears to be indicated, and if the fragment is loose in the joint it should be removed as soon as possible to prevent further intra-articular damage.

SUMMARY

Twenty-eight cases of osteochondritis dissecans affecting the tibio-tarsal joint, mostly in young Standard-bred trotters, are reported. The clinical and radiological features are described and the results of synovial fluid examinations recorded. In 18 horses the fragments were removed surgically, and histological examination of these specimens indicated that osteochondritis dissecans in the horse resembles more closely the condition in man than that seen in dogs.

REFERENCES


Paget, J. (1870). On the Production of some of the Loose Bodies in Joints. Saint Bartholomew's Hospital Reports, 6, 1.


Fig. 8. Defect of the lateral ridge of the tibiotarsal bone after being curetted.