Deterioration Following Meniscectomy - An Exaggeration ?

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ABSTRACT : Twenty four mature New Zealand white rabbits were operated on; in one group both menisci were removed; in another both menisci were also removed and the anterior cruciate ligament was divided besides, in the third group a sham operation was done and used as a control. In 6 months the animals were sacrificed and the articular cartilage changes were quantitated using Collins' grading and Mankin's score. The changes following meniscectomy only were considered mild whereas the changes following meniscectomy and division of anterior cruciate ligament were considered severe. The authors feel joint deterioration following meniscectomy although significance is usually mild. Severe joint deterioration that follows meniscectomy is due to the catalytic effect of any concomitant instability following meniscectomy.

INTRODUCTION

Fairbank[1] recognised post-meniscectomy changes in 1948 but perhaps because the changes were not perceived as severe, it had little impact on the attitude of orthopaedic surgeons to the meniscus and meniscectomy continued to be undertaken with impunity. The reemergence of interest in joint deterioration following meniscectomy in the 1960s[2-5] and the elucidation of the role of the meniscus in force transmission across the knee in the 1970s[6] earned for the meniscus appropriate importance and this led to a more cautious and conservative approach when dealing with meniscal injury. Unfortunately ;however, these new findings have led to an exaggerated importance of the meniscus and today the results following meniscectomy is viewed with considerable pessimism and patients who have had meniscectomy live in constant fear of developing degenerative arthritis in the affected joint[2-5].

This situation had risen largely because the poor results reported by authors studying the long term effects of meniscectomy[2-5]. It is our contention that the most of these studies, the authors have failed to take into consideration the adverse influence on the long term results of concomitant factors like instability which is a factor that is so often associated with meniscal injury[7]. Admittedly, in more recent studies, authors have made attempts to isolate such factors[8] but it must be recognised that it is not easy to establish clinically and retrospectively in all cases the presence or absence of instability.

Because of the difficulty of being absolutely certain of the presence or absence of instability, we have in the past studied cases of discoid meniscal injury where the underlying lesion is an abnormal meniscus and instability is thought to be an insignificant feature[9]. In these cases, joint deterioration was noted to be mild at an average of 6 years post-meniscectomy. Kurosaka et al[10] also noted that there was significant joint deterioration in only 10% of cases in 20 year follow-up study. These findings contrast strikingly with reports on deterioration following meniscectomy[2-5]. As the controversy, this could not be resolved clinically because of the difficulty of ascertaining the presence of absence of minor instabilities that we undertook an experimental study in rabbits to quantitatively verify the changes following meniscectomy in a stable knee and the extent to which these changes are influenced by the presence of concomitant instability.

MATERIALS AND METHODS

Twenty-four New Zealand white rabbit 1.6 kg to 2 kg weigh were used for the experimental study. There were three experimental models consisting of eight animals each. In the first group both menisci were removed. In the second group both menisci were removed and anterior cruciate ligament divided. The third group had a sham operation done.

The animals were anaesthetized using intravenous thiopentone. In all rabbits, the left knee was the subject of the experiment. The knee was exposed through a medial parapatellar incision and at the end of the experiment the wound was closed in two layers using catgut. The operated limb was not immobilised. As for the first two weeks, the cage activity was allowed and following that the rabbits were allowed normal and cage activity.

All animals were sacrificed in six months. At the sacrifice, the gross morphology of each knee was studied and graded according to Collins and McElligott[11]. The histologi-

cal and histochemical findings (using 10 micron decalcified sections stained with H&E and Safranin-O) were scored according to Mankin et al[12].

RESULTS

The results of our study are detailed in Table 1. In the first group of animals in which both medial and lateral menisci were removed, the gross morphological study revealed mild damage of the articular cartilage (Figs 1A and B). There was no evidence of meniscal regeneration in this model. There were four animals with Collins' grade 1, three with Collins' grade 2 and one with Collins' grade 3. Mankin's score ranged from 5 to 10 with an average of 7. In the 2nd group of animals with medial and lateral meniscectomy and ACL division, two operated knees were graded as Collins' grade 3 and six were graded as Collins' grade 4. The Mankin's score ranged from 11 to 14 with an average of 12.5 (Figs 2A and B). The operated knees following the sham operation did not reveal significant articular cartilage changes (Table 1). In all rabbits, the contralateral knee was noted to be normal.

Table 1

Experimental Model	No of Specimen	Collins' Grade 0	1	2	3	4	Mankin's Score Range	Mean
Meniscectomy	8	0	4	3	1	0	5 to 10	7
Meniscectomy and ACL division	8	0	0	0	2	6	11 to 14	12.5
Sham operation	8	8	0	0	0	0	1 to 2	1.5

Figure 1A : Gross specimen of knee (following medial and lateral meniscectomy) showing mild articular cartilage deterioration (Collins's grade 3).

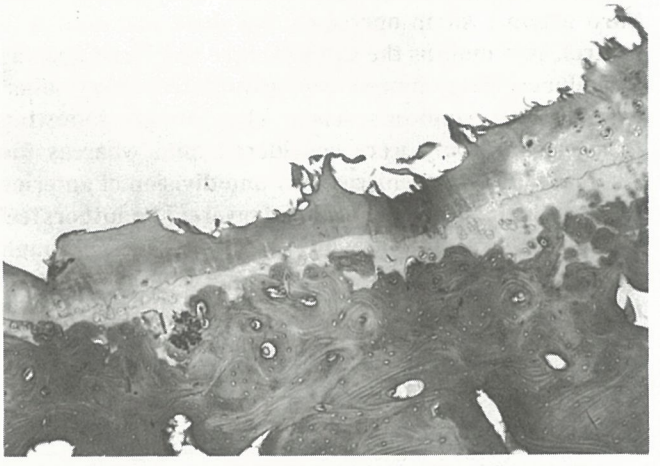

Figure 1B : Histological section (H&E stain, X50) of articular cartilage of tibia showing superficial erosion and radial clefts to the transitional zone and hypocellularity and cloning of cells. The tidemark remained intact.

Figure 2A : Gross specimen of knee following medial and lateral meniscectomy and anterior cruciate division showing severe articular cartilage erosion and eburnation of bone (arrowed) (Collins' grade4).

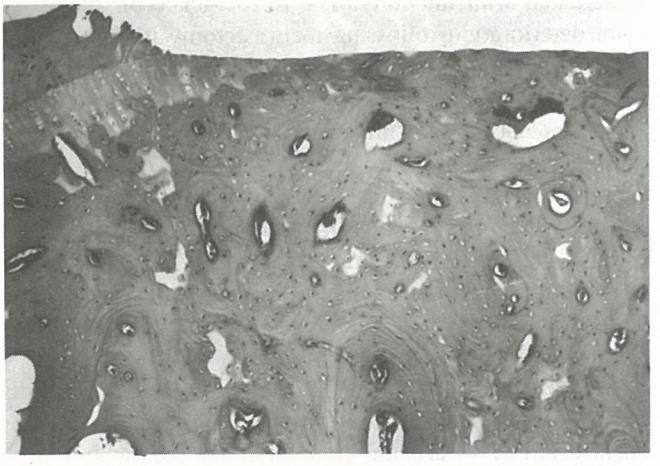

Figure 2B : Histological section (H&E stain, X50) of tibial surface showing surface denuded of articular cartilage. The calcified zone of cartilage and the tidemark was completely destroyed leaving subchondral bone exposed.

DISCUSSION

The articular cartilage damage averaging 7 points on the Mankin's score noted in knees where meniscectomy only is undertaken suggest that the menisci have a protective function on the articular cartilage but its loss led to only mild deterioration of the articular cartilage. The severe articular cartilage damage averaging 12.5 points in the Mankin's score seen in the group with meniscectomy and ACL division demonstrated the catalytic contribution of instability to deterioration of articular cartilage in meniscectomised knees.

These findings suggest that we may have over exaggerated the joint deterioration following isolated meniscectomy. We do not mean to imply that the isolated loss of meniscus is inconsequential and meniscectomy could be undertaken with impunity and attempts to repair peripheral meniscal injuries forsaken.

The clinical implication of this study relates to situations where complex tear of menisci exist in the absence or presence of instability. In the absence of instability, either partial or complete meniscectomy could be undertaken without having to fear the prospect of developing gross joint deterioration in the years to come. In the presence of instability however, because of the risk of developing severe degenerative joint changes following meniscectomy[5,13], meniscectomy should be accompanied with reduction of the stresses of instability. This reduction of the stresses of instability may be achieved by a reduction of activity level or by surgically stabilising the knee.

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