

Injury to the Throwing Arm

A Study of Traumatic Changes in the Elbow Joints of Boy Baseball Players

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■ *X-ray studies were made of both elbows of 162 boys in the 9 to 14 year age group, divided into three categories: Pitchers, non-pitchers, and a control group who had never played organized baseball.*

Changes involving the medial epicondylar epiphysis and opposing articular surfaces of the capitulum and head of radius in the throwing arm appeared to be in direct proportion to the amount and type of throwing. The most striking changes were in the arms of pitchers. Some degree of accelerated growth, separation and fragmentation of the medial epicondylar epiphyses was noted in the throwing arm of all 80 pitchers in the study. Five cases of traumatic osteochondritis of the capitulum and head of radius, and one case of juvenile osteochondritis of the head of the radius were also found among the pitchers.

Better medical supervision and stress on prevention are needed, especially in the Southern California area where climatic conditions favor prolonged seasons and throwing practice the year around.

THROWING A BASEBALL hard, especially as required by pitchers, is a relatively abnormal activity of the arm and it puts an unusual repetitious strain on wrist, shoulder and elbow. The elbow joint, with which this communication is concerned, is forcefully whipped from a position of acute flexion into complete extension with either pronation of the forearm or (if throwing a curve ball) supination and ulnar flexion of the wrist. This latter maneuver puts additional traction strain on the medial epicondyle of the humerus which is the point of attachment of the pronator and flexor muscles of the forearm. Since the epiphyses are still open at this age, the epicondyle is weakly attached to the humerus and, therefore, quite vulnerable to repeated forceful pull of these muscles.

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Baseball coaches and managers argue that many sore arms are due to wrong throwing motions or failure to warm up properly, which is often true in adults. In youngsters 9 to 14 years of age, however, regardless of the throwing motion, it is quite obvious that the un-united epiphyses must still be subjected to the pull of the attached muscles. The opposing articular surfaces of the joint are also subjected to repeated trauma from excessive throwing. Trauma of this kind can eventually bring about osteochondritic changes with exfoliation of the cartilage. This is the cause of loose bodies and bone chips so commonly found in professional pitchers, but rarely seen in youngsters of this age group before the advent of organized baseball programs for them. Owing to favorable climatic conditions, the baseball season in Southern California

is overly prolonged and many youngsters, especially pitchers, practice throwing the year around. Several enthusiastic fathers have admitted building pitching mounds in their back yards so that their boys might practice.

The frequency of elbow problems with x-ray changes among pitchers coming to our attention prompted me to obtain the sanction and cooperation of Little League and Pony League administrators to conduct a large scale survey. The survey consisted of taking comparative x-ray films of both elbows of 162 youngsters in the 9 to 14 year age group divided into three categories: pitchers, non-pitchers, and a control group who had never played organized baseball. No boy with a history of elbow fracture, severe infection or deformity of either arm was included in the study. Pertinent questions, primarily directed at obtaining information about pitchers, were asked of each boy. Eighty of those questioned were pitchers and the average length of time they had pitched was three years. The questions and the incidence of "yes" answers were as follows:

	"Yes"	Per Cent
Do you throw curves?	68	85
Do you play other position days not pitching?....	77	98
Do you practice throwing at home during and off season?	69	88
Do you have elbow soreness or pain while pitching?	34	45
Have you reported soreness or pain to manager or parent?	21	27
Have you been seen by physician?	9	12
Is there history of heel or knee pain?	13	17

Because of apprehension and suspicion that to admit they had elbow soreness might prevent them from playing, it is probable that the number with soreness was higher than 45 per cent. The nine boys seen by a physician either had severe pain during the season or waited till after the season was over to report. In all other cases the pain was treated by managers and parents with heat, massage or linaments, or was ignored. The 13 boys with history of heel or knee pain also showed epiphyseal involvement in the elbow.

The x-rays show a very definite pattern of changes involving the medial epicondylar epiphysis and radiohumeral articular surfaces of the elbow joint of the throwing arm only. The changes were in direct proportion to the amount and type of throwing, as follows:

Roentgenographic Changes	Pitchers (80)	Non-Pitchers (47)	Control Group (35)
Accelerated growth and separation medial epicondylar epiphysis	76	7	3
Fragmentation medial epicondylar epiphysis	39	6	2
Osteochondritis capitulum humerus and head of radius	6	0	0

Reports of Cases

The following cases are typical of those in which there were changes involving the medial epicondyle:

CASE 1. The patient, 13 years of age, had pitched two years of Little League and admitted soreness in the elbow but did not tell the manager or his parents lest he not be allowed to play. During Pony League tryouts pain necessitating medical attention had developed. Upon examination pronounced swelling and tenderness were noted over the medial aspect of the left elbow overlying the medial epicondyle. X-ray films (Figure 1) showed increased density and enlargement of the left medial epicondyle as compared with the right arm. Without comparative x-ray films, however, this would have been interpreted as normal.

This was a typical case of epiphysitis which subsides on complete rest of the arm. The patient in this case could resume playing ball but should not pitch until the epiphyses are closed and he should avoid unnecessary throwing.

CASE 2. The patient was a 12-year-old boy who had been pitching one year, throwing curves. He



Figure 1 (Case 1).—Medial epicondylar epiphysitis showing increased density and enlarged left medial epicondyle.



Figure 2 (Case 2).—Separation right medial epicondylar epiphysitis with accelerated growth.

also played third base and catcher on days he was not pitching. He admitted having elbow soreness when throwing. X-ray films (Figure 2) showed separation and accelerated growth response to traction strain from excessive throwing.

CASE 3. A 13-year-old boy who pitched and played catcher for four years of Little League admitted some soreness in the elbow during these years. Severe pain in the elbow had developed when he was trying out for the Pony League. On examination, decided tenderness and swelling were noted over the medial aspect of the elbow. X-ray studies (Figure 3) showed medial epicondyle fragmentation of dissecans type and accelerated growth as compared with the opposite arm. The lesion was completely healed after three months of complete rest of the arm.

The boy in this case had apophysitis of both heels at the age eight, indicating a predisposition to epiphyseal involvement. He resumed playing ball but not pitching or throwing unnecessarily.

CASE 4. The patient, aged 12, had been pitching for two years, throwing curves. When not pitching he played third base. He admitted having elbow soreness. An x-ray film (Figure 4) showed characteristic fragmentation of avulsion type with accelerated growth as compared with the opposite arm.

Approximately 50 per cent of the pitchers in the

series showed change of this type in the throwing arm only. Figure 4 also shows an x-ray film of the elbow of a 21-year-old pitcher who had pitched ten years, from Little League through college, and admitted having considerable pain during his Pony League years. The irregularity of the lower end of the epicondyle of the throwing arm shown in the film conforms with the fragmentation seen in the elbow of the 12-year-old patient. Apparently this represents the end result of lesions of this type. The 21-year-old with the residual radiographic change still had elbow pain when he threw hard and was quite worried about his future, as he had just signed a major league contract. In my opinion, his pitching career is already behind him.

CASE 5. The patient was a 13-year-old boy who had been pitching since age nine despite frequent soreness of the elbow. He had been throwing curve balls since age 11. He said that something snapped in his elbow while he was pitching in a Pony League game and severe pain and swelling followed immediately. X-ray films showed a complete transverse fracture through the medial epicondyle with greatly accelerated growth as compared with the opposite arm. The fracture was of fatigue type rather than fragmentation. The boy gave up baseball but two

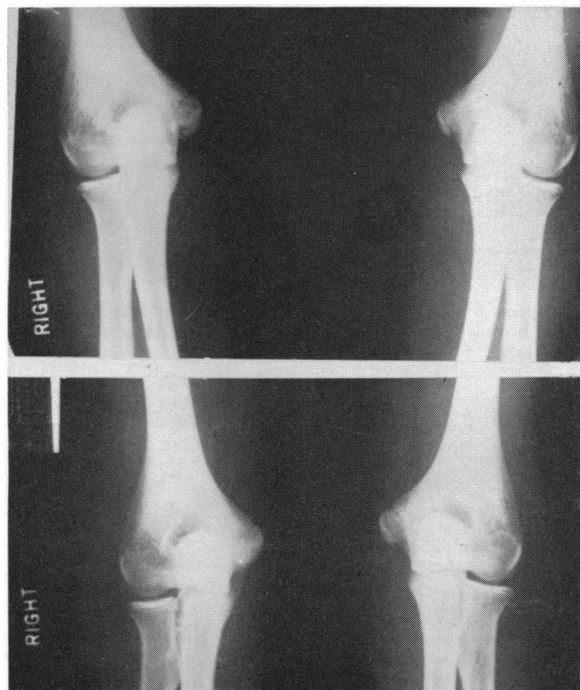


Figure 3 (Case 3).—Upper film: Pronounced accelerated growth with lesion of dissecans type of the right medial epicondyle. Lower film: Lesion healed after three months of complete rest.

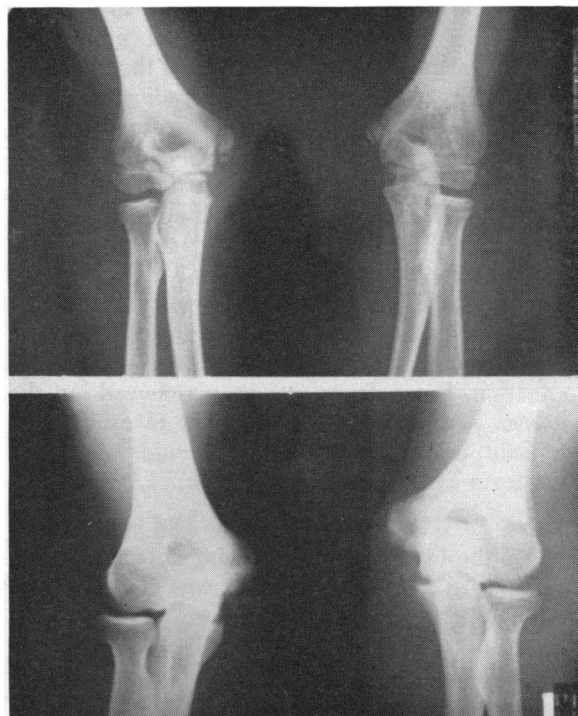


Figure 4 (Case 4).—Upper film: Avulsion fragmentation of right medial epicondyle with accelerated growth as compared with left. Lower film: Elbows of 21-year-old pitcher. Irregularity of lower end of medial epicondyle of throwing arm conforming to fragmentation noted in upper film.

years later was still having elbow pain when he threw hard on his paper route.

In the following cases the patients had osteochondritic lesions involving the articular surfaces of the capitulum of the humerus and the head of the radius. As such lesions are serious and can become permanently disabling, early recognition and treatment is extremely important. In all but one of the cases reported in the following paragraphs the pathologic process was far advanced before medical attention was sought. Since in some of these cases the existence of the condition was not known until it was noted in the present survey it is probable that there are others still undiagnosed. A probable eventuality in many cases of this kind (as in one here reported) is operation for removal of loose bodies from the elbow joint in later life.

CASE 6. A 14-year-old boy pitched Little League ball from age nine until age 12, when he had to quit because of severe pain in the elbow. He did not, however, seek medical attention. He had thrown curve balls and practiced throwing before and after the baseball season. At age 14 severe pain developed in the elbow when he tried throwing a football. As he could not completely straighten the elbow, he consulted a physician for the first time.

Upon examination pronounced tenderness was noted over the radiohumeral joint. X-ray studies (Figure 5) showed a large area of erosion of articular cartilage of the capitulum of the humerus, enlargement of the head of the radius and premature closure of the epiphysis as compared with the opposite arm.

At operation, exfoliation of cartilage from the opposing surfaces of the capitulum and the head of the radius (Figure 6) were noted and there were loose fragments within the joint. On flexing the elbow to 90° the enlarged deformed head of the radius was seen to make firm contact with the capitellum and to subluxate in order to effect complete supination. Loose fragments were removed but the patient's parents would not consent to excision of the head of the radius which should have been done for a better functioning elbow.

CASE 7. A 16-year-old boy who had pitched four years in the Little League, throwing curves, and had played third base on days he was not pitching, stopped pitching at age 13 because of pain in the elbow, and played in the outfield. At age 16 the elbow pain was so severe that he could not straighten the joint completely, and at last he consulted a physician. Upon examination pronounced tenderness over the radiohumeral joint and 30 degree restriction of extension of the elbow was noted. X-ray films showed a large area of erosion of articular cartilage of the capitellum, enlargement of the

radial head and premature closure of the medial epicondylar epiphysis. Operation was recommended but was refused.

CASE 8. The patient, 13 years of age, had pitched and played other positions for five years. He had pain in the elbow which became progressively worse during the Pony League season, but a physician was not consulted until the season ended. On examination pronounced tenderness was noted over the radiohumeral joint. X-ray films showed the usual large area of osteochondritis of the capitulum associated with accelerated growth of the epicondyle.

The patient had had apophysitis of both heels at age eight, a condition which should be interpreted as definite warning of impending danger with the first complaint of elbow soreness. Conservative treatment with complete rest from throwing was recommended in the hope that the lesion would heal.

CASE 9. A 9-year-old boy who had been pitching for a year, throwing curves, denied having elbow pain, but not convincingly. When he reported for routine x-ray examination for the survey, an early osteochondritic lesion (Figure 7) was noted. After four months of complete rest of the arm, the lesion healed completely. This lesion would no doubt have



Figure 5 (Case 6).—Osteochondritis of capitulum of right humerus with head of radius enlarged as compared with left.

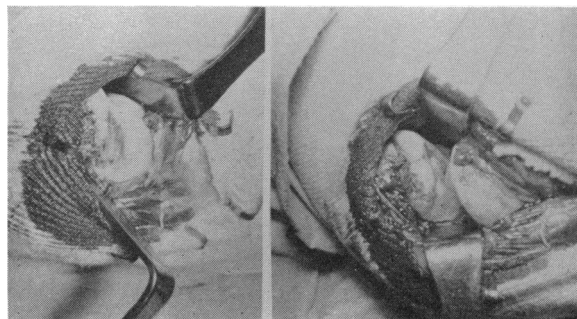


Figure 6 (Case 6).—Exfoliation of articular cartilage of opposing surfaces of the capitulum (right), and head of the radius (left) as seen at operation.

progressed to the advanced stage seen in the previously reported cases except for chance discovery in a routine survey, which calls attention to its need for early diagnosis and medical supervision.

CASE 10. The patient, 19 years of age, had pitched three years in the Little League although he had had to quit because of elbow pain. At age 15, the elbow became quite painful and he could not straighten it completely. X-ray films taken at that time showed a typical osteochondritic lesion of the capitulum with the head of the radius enlarged and deformed. Operation was advised but was refused. The patient was not seen again until, at age 19, he returned with complaint of "locking" of the elbow. X-ray films showed calcified loose bodies in the joint. They were surgically removed and the deformed head of radius was excised. The result was relief of pain and good functioning of the elbow for normal non-strenuous use of the arm.

CASE 11. A 12-year-old boy who had pitched three years in the Little League, throwing curves, and also playing other positions when not pitching, developed severe pain in the elbow while pitching

in a Little League playoff game. A physician examined him, taking x-ray films (Figure 8). Complete rest was advised but the advice was disregarded and the patient's parents and his coach carried out heat treatments. The following year, during a try-out for the Pony League, the elbow pain became unbearable. X-ray films showed osteochondritis of the head of the radius. The lesion in this case is rare, only six other cases having been reported in the literature. The patient gave up playing ball and films taken two years later showed healing of lesion but with deformity of the head of the radius as compared with the opposite arm.

Although this is a relatively rare lesion, the fact that it occurred only in the throwing arm indicates that repetitious trauma was a definite etiological factor. Had medical advice been heeded with the initial onset of symptoms, the progression of the lesion could probably have been prevented.

Conclusion

This study quite clearly demonstrated the so-called Little Leaguer's elbow to be primarily a medial epicondylar epiphysitis, and less commonly an osteochondritis of the capitulum of the humerus and head of the radius.

Before the development of organized baseball programs for youngsters of this age, osteochon-

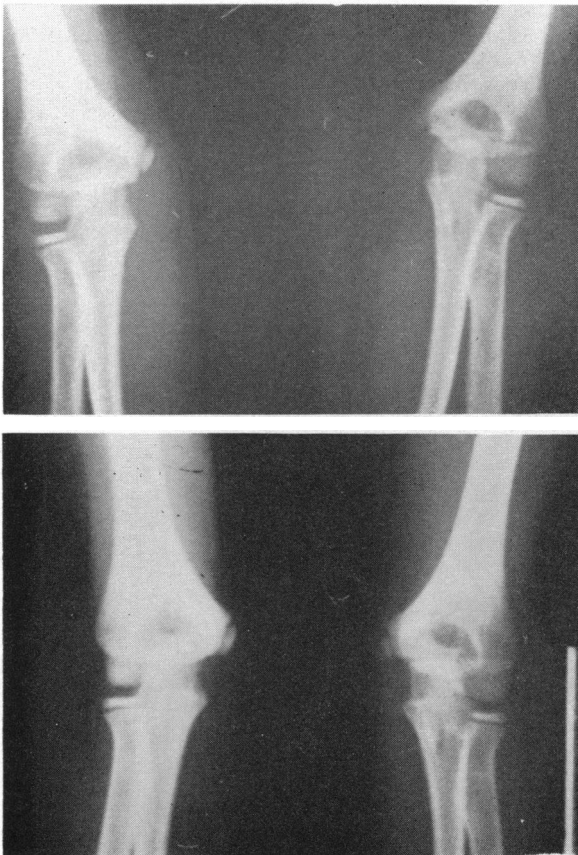


Figure 7 (Case 9).—Upper film: Early osteochondritic lesion of the capitulum of the humerus. Lower film: Lesion healed after four months of complete rest of arm.

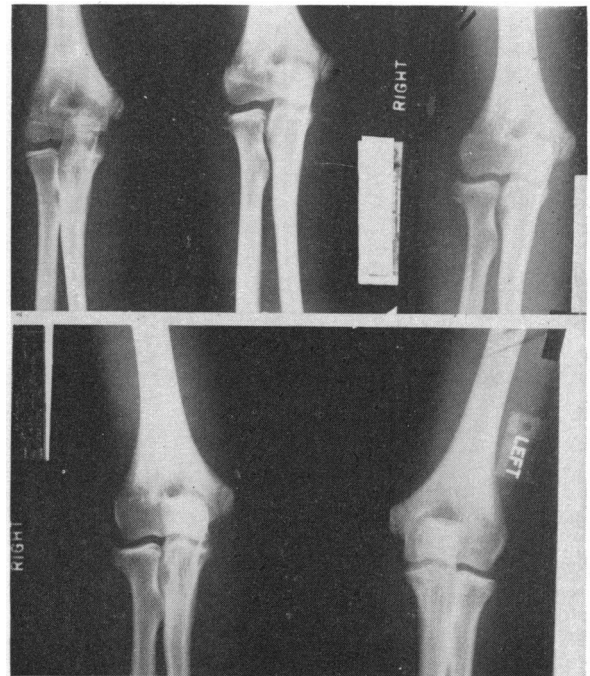


Figure 8 (Case 11).—Juvenile osteochondritis of head of radius. Upper left film taken at onset of symptoms. Center and right films one year later and 18 months later. Lower film two years later, showing deformed head of radius as compared with opposite elbow.

dritis of the capitellum was rarely seen, and medial epicondylar epiphysitis was not described in the medical texts.

The fact that these conditions develop only in the throwing arm, leaves no doubt that the major contributing cause is excessive repetitious trauma. These conditions seem to reach their peak, symptomatologically, at the Pony League age of 13 or 14. The insidious onset, with failure to report or investigate elbow soreness earlier, would explain the misleading Little League statistics indicating negligible epiphyseal involvement. The treatment for these conditions, as in all diseases or injuries, is primarily prophylactic or preventive. The following recommendations seem in order:

1. Establish medical advisory boards at national and local levels.
2. Educate and alert parents, coaches, administrators and family physicians that these conditions do exist, that the presenting symptom of soreness or pain in this age group indicates epiphysitis and should not be treated as a muscle soreness routinely found in adult pitchers following a game.
3. Encourage youngsters to report elbow pain or soreness immediately for proper evaluation, with reassurance that doing so does not always mean that they cannot play ball anymore.
4. Discourage youngsters from practicing pitching at home before, during and after the baseball

season, as excessive throwing at this age invites trouble rather than perfection.

5. Abolish curve ball throwing at this age, as it not only puts additional strain on the elbow but encourages excessive throwing practice to perfect.
6. Shorten the playing season, especially in Southern California where it is overly prolonged.
7. Restrict pitchers to two innings per game, instead of six, until the epiphyses are completely closed. (This maturity usually occurs between 14 and 17 years of age.)
8. Divide Little League into two groups—one for 9 and 10-year-olds, the other for 11 and 12-year-olds—in recognition of the great range of size and weight of boys in the age range.

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