

The Classic

Fractures of the Neck of the Femur in Childhood*

John C. Wilson, Sr., MD (1888–1957)
The 7th President of the AAOS 1938

John Cree Wilson, Sr, was born in Santa Ana, California, and received his undergraduate degree from the University of California in 1908 and medical degree from the University of California, San Francisco, in 1912 [2]. He had a one year internship, then entered private practice, but apparently believed he needed more training and in 1916 quit his private practice for postgraduate training at the Massachusetts General Hospital. He completed that training, then served in military hospital at Fort McPherson, Georgia, when the US entered WW I. Following discharge he moved to Los Angeles, working at the Los Angeles General Hospital and then the Children's Hospital of Los Angeles. He became Chief of the Orthopaedic Division at the Children's Hospital, a post he retained until 1955.

Wilson was one of the first three AAOS Presidents (the others being Drs. Melvin Henderson and Edwin Ryerson) who was also a founding member of the American Board of Orthopaedic Surgery in 1934 [3]. He was also one of the first three AAOS Presidents (the others being Philip D. Wilson and Melvin Henderson) who had a son, John C. Wilson, Jr, who later served as a President of the AAOS. In his Presidential Address to the AAOS in Memphis, Tennessee in 1939, he noted, "It is indeed gratifying to see that our Program Committee has stepped outside the bounds of our specialty to bring speakers from other fields of medicine. A good orthopaedic surgeon must first of all be a good doctor...Unfortunately, many specialists see problems from only one point of view. Such short vision inevitably produces detrimental results which might often be avoided by more frequent exchange of ideas with out medical colleagues" [1].



John C. Wilson, Sr, MD is shown. Photograph is reproduced with permission and ©American Academy of Orthopaedic Surgeons. *Fifty Years of Progress*, 1983.

The article we highlight, "Fractures of the Neck of the Femur in Childhood" [4], relates to his primary interest, children's orthopaedics. He commented, "A review of the English literature on the subject of fractures of the neck of the femur in childhood leaves one with the impression that they respond to the regular forms of treatment as do those in adults...A study of the author's series of cases gives rise to a somewhat different view." He acknowledges several earlier case reports suggesting higher rates of complications, and added to that small literature his own series of ten patients. In documenting the outcomes he remarked, "A study of this series of patients forces us to conclude that fractures of the neck of the femur in childhood are serious injuries." Clearly, Wilson was one to challenge dogma. One observer remarked, "There were no ex cathedra pronouncements by the Chief, but rather an opportunity for

each resident and attending staff member to state his viewpoint and opinions, which were differentially sorted, analyzed, and coordinated by the Chief" [2].

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4. Wilson JC. Fractures of the neck of the femur in childhood. *J Bone Joint Surg Am*. 1940;22:531–546.

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Introduction

A review of the English literature on the subject of fractures of the neck of the femur in childhood leaves one with the impression that they respond to the regular forms of treatment as do those in adults. No great number of cases is tabulated, but in each instance the discussion concerns chiefly the various methods of treatment, with the conclusion that good functional recovery is the rule. A study of the author's series of cases gives rise to a somewhat different view.

Johansson, in 1927, published his observations on two patients, under twenty years of age, in whom aseptic necrosis of the femoral epiphysis followed fracture of the cervical neck. Zur Verth, in 1935, after gathering seven published cases and adding four of his own, stated that aseptic necrosis of the femoral head follows fracture of the cervical neck in children in the proportion of four to ten. Nielsen, in 1938, reported three cases of Legg-Calvé-Perthes disease following fracture of the neck of the femur. The changes are explained by a vasomotor disturbance of the vessels supplying the femoral head.

The incidence of this fracture is not great. There were two fractures of the neck of the femur in children among 600 fractures of the upper end of the femur treated at the Los Angeles General Hospital in the past ten years. Since August 1930, the author has seen ten such fractures in children, and the following study of the end results in these cases is presented to point out the dangers which follow this injury and to suggest methods of treatment.

Sex

As would be expected, seven of the patients were males and three were females.

Age

Four were in the first decade of life and six were in the second.

Etiology

In 1935 a motion picture appeared which glorified the athletic youth by portraying a young man springing from one branch of a tree to another with the greatest of ease. Stimulated by this glamorous hero, two young men, who were less dextrous in the tree tops, sustained a fracture of the neck of the left femur. Seven suffered other forms of severe trauma, caused by falling forty feet from a cliff, falling from a horse, and being in an automobile accident. In only one case was the trauma slight. In this case the femoral neck in a paralyzed extremity was fractured by a fall while the patient was walking across the floor.

Pathology

Six of the fractures occurred in the left femur and four in the right. In no instance was the fracture located near the head. They all occurred centrally or near the base of the neck.

Treatment

Eight of the patients were treated by the so-called Whitman cast. In seven instances satisfactory reduction was not maintained. The slipping of the fragments was discovered in one case early enough to allow correction and transfixion of the shaft of the femur by a pin, which was incorporated in the cast.

In one patient the femur was nailed, and, through no fault of the procedure, the case terminated unfortunately.

Table 1. Résumé of ten cases of fracture of the femoral neck in children

Case no.	Sex	Age (Years)	Date of injury	Side	Treatment	Complications	End result
1	Female	6	Aug. 1930	Right	Cast and crutches Bone-grafting operation Cast for 5 months	Non-union Fragments slipped	Patient died on June 25, 1931, from shock following bone-grafting operation. Feb. 1934: 3 centimeters of shortening; 45 degrees of flexion deformity; Growth changes in head; Limp.
2	Female	9	Feb. 1931	Left			
3	Male	11	Jan. 24, 1932	Left	Cast Cast and pin transfexion through shaft of femur	Fragments slipped in first cast	Nov. 29, 1939: 2 centimeters of shortening; 3 centimeters of atrophy of thigh; 25 degrees of limitation of flexion and external rotation; 20 degrees of limitation of adduction and abduction; 10 degrees of limitation of internal rotation and extension; Limp.
4	Male	12	Mar. 26, 1934	Right	Cast for 120 days July 15, 1938: Subtrochanteric osteotomy to correct flexion-adduction deformity of hip	Phlebitis	Dec. 8, 1939: 1 centimeter of shortening; 9 centimeters of atrophy of thigh; 3 centimeters of atrophy of calf; 25 degrees of limitation of flexion; 15 degrees of limitation of extension; Slight limp.
5	Male	12	July 14, 1935	Left	Traction for 35 days Cast for 60 days Crutches for 9 months	None	Circulatory changes in head of femur; Slight limitation of internal rotation in flexion; Good function.
6	Male	9	July 21, 1935	Left	Cast Nov. 20, 1935: Bone-grafting operation Dec. 8, 1936: Osteotomy to correct coxa vara	Sept. 12, 1935: Acute appendicitis	Apr. 1938: Stiff hip, 32 months after injury.
7	Male	13	Aug. 1935	Left	Manipulation (osteopathic) for 5 months Cast for 90 days	None	Jan. 5, 1940: 3 centimeters of shortening; 20 degrees of limitation of adduction; No rotation or extension; Limp.

Table 1. continued

Case no.	Sex	Age (Years)	Date of injury	Side	Treatment	Complications	End result
8	Male	15	Dec. 12, 1937	Left	Traction Manipulation Feb. 10, 1938: Nailing Feb. 27, 1938: Reconstruction operation	Feb. 23, 1938: Nail broke Apr. 18, 1938 Wound infected	Nov. 1939: Hip stiff, with pain and swelling; Total disability.
9	Female	12	July 15, 1938	Right	Oblique subtrochanteric osteotomy and cast	Poliomyelitis Paralytic dislocation	Good function.
10	Male	8	Nov. 3, 1939	Right	Cast		Undetermined—too recent.

An oblique subtrochanteric osteotomy was done in one case in which the hip dislocated, because of muscle weakness following infantile paralysis. It was hoped that the osteotomy would stabilize the hip and facilitate healing of the fracture, both of which were accomplished.

Mortality

One patient died as a result of treatment. The child entered the Hospital ten months following the injury, with a non-union of the fracture after treatment by the cast method. An intramedullary bone-grafting operation was done, and the patient died from shock the same day.

Results

One of the nine remaining patients was injured only two months previous to this report, so that the outcome cannot be anticipated. Of the remaining eight patients, two have good functional results.

Comment

Many interesting points arise in the survey of these patients. The circulation of the femoral head has not been worked out as yet to the satisfaction of all investigators. Cella, after a series of experiments on animals, came to the conclusion that, while the vessels of the ligamentum teres play a part in the development of the femoral head, they are not essential, and their interruption does not alter its conformation. Nielsen, on the other hand, thinks that disturbance of the nerve supply to the vessels is the prime factor. Irrespective of cause, gross disturbance of joint mechanics usually follows. Such joints must show premature evidence of wear and tear, which is commonly called degenerative arthritis.

Conclusions

A study of this series of patients forces us to conclude that fractures of the neck of the femur in childhood are serious injuries. Maintenance of reduction in the Whitman cast is difficult. Perhaps a nail would be more effective, but, again, will it damage the epiphyseal plate? One should be alert to the fact that growth changes are to be expected. The disturbances in growth in this series of patients do not conform to the classic picture of Legg-Calvé-Perthes disease. Oblique subtrochanteric osteotomy is helpful in bringing a limited arc of motion into useful planes.

Fig. 1A–F (A) Case 3. January 24, 1932. Fracture of the neck of the left femur in a boy, eleven years of age, who fell fifty feet from a cliff. The fracture was reduced and the hip placed in a Whitman cast. The position could not be maintained without transfixion of the femoral shaft. (B) Case 3. April 12, 1932, three months after injury. There is no evidence of repair, and the head is dense. (C) Case 3. September 8, 1932, eight months after injury. The fracture of the neck is healing. The circulation of the head is markedly disturbed. (D) Case 3. September 15, 1935, three years and eight months after injury. The fracture is healed; the head is small, showing evidence of necrosis and revascularization. (E, F) Case 3. Lateral and anteroposterior views of left femur on November 29, 1939, nearly eight years after injury, reveal a distorted head and neck. The leg is 2 centimeters short, and all movements of the hip are restricted.

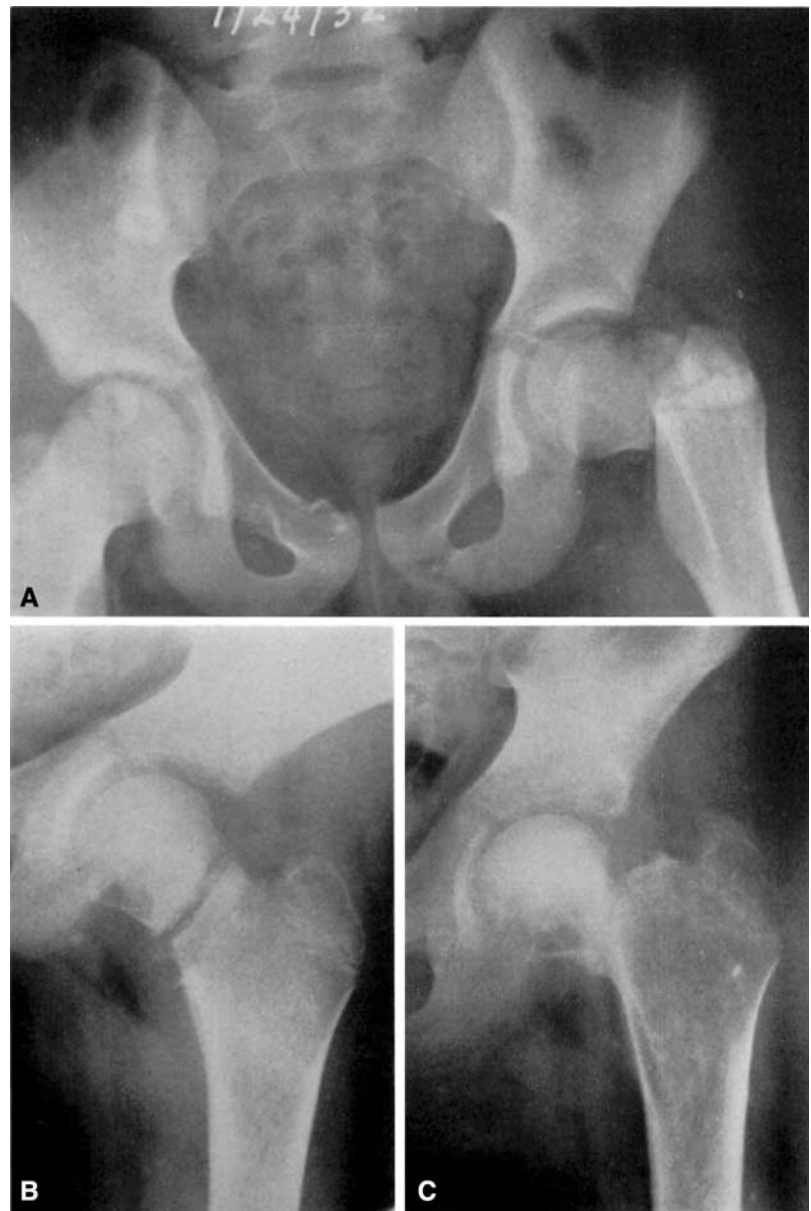


Fig. 1A-F continued.

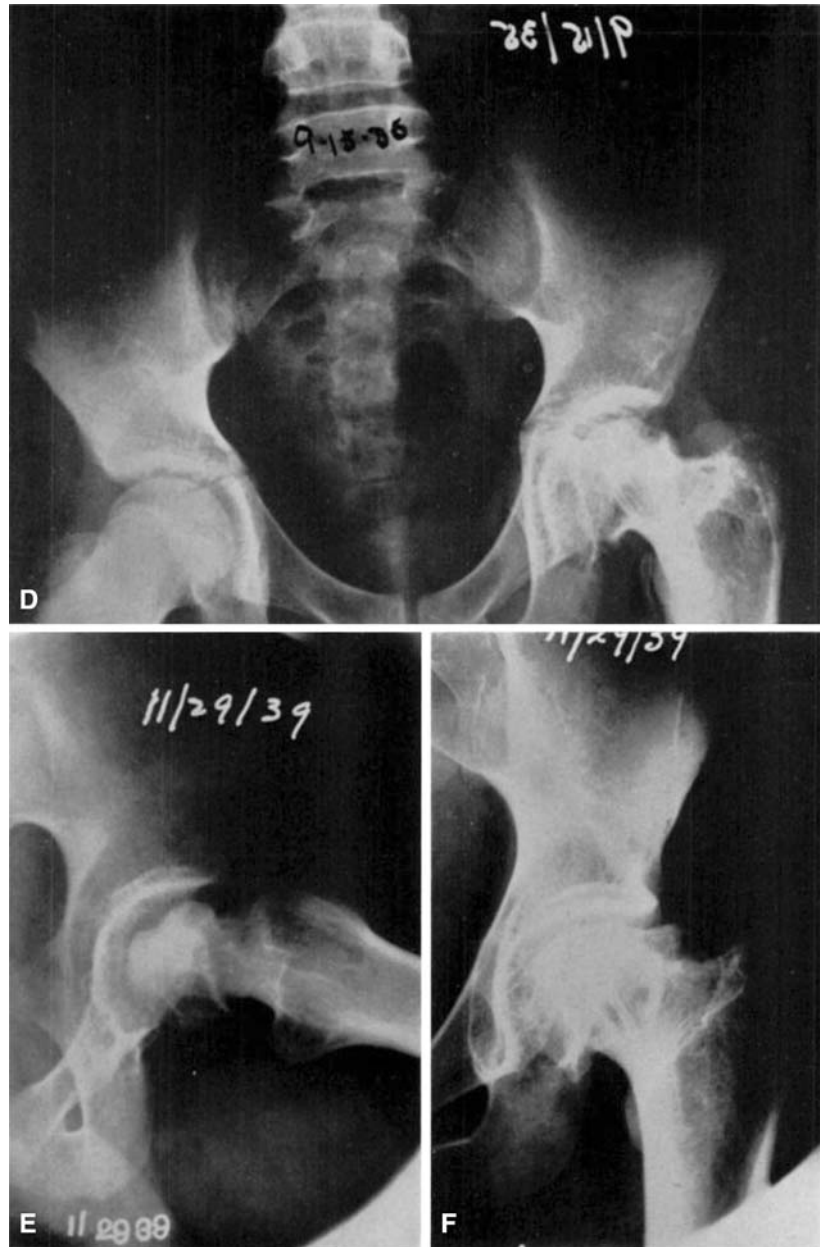




Fig. 2A-J (A) Case 4. A boy, aged twelve, fell eight feet from a tree, sustaining a fracture of the neck of the right femur. The fracture was reduced and fixed with a Whitman-type plaster cast. (B) Case 4. June 21, 1934, three months after injury. The fracture is healed in fairly good position, although the head is slightly rotated. (C) Case 4. September 17, 1935, eighteen months after injury. Changes in the head and neck are taking place. (D) Case 4. February 19, 1936, twenty-three months after injury. The growth disturbance is more evident. (E) Case 4. August 7, 1936, five months later than Fig. 2-D. The irregularity in the head and neck is more pronounced. (F) Case 4. April 5, 1937, eight months later than Fig. 2-E. (G) Case 4. May 21,

1938, four years and two months after the injury. The head and neck are markedly distorted. (H) Case 4. October 11, 1938, four and one-half years after injury. On July 15, 1938, a subtrochanteric osteotomy had been done to correct an adduction and flexion deformity of the hip. The boy limped badly at that time and had 7.5 centimeters of apparent shortening. (I, J) Case 4. March 29, 1939, five years after the accident. These roentgenograms show a badly deformed but revascularized head and neck of the femur. The leg is 1 centimeter short. The thigh and calf are atrophied. Flexion is limited 25 per cent. and extension, 15 per cent. Impossible as it may seem, other movements of the hip joint are free.

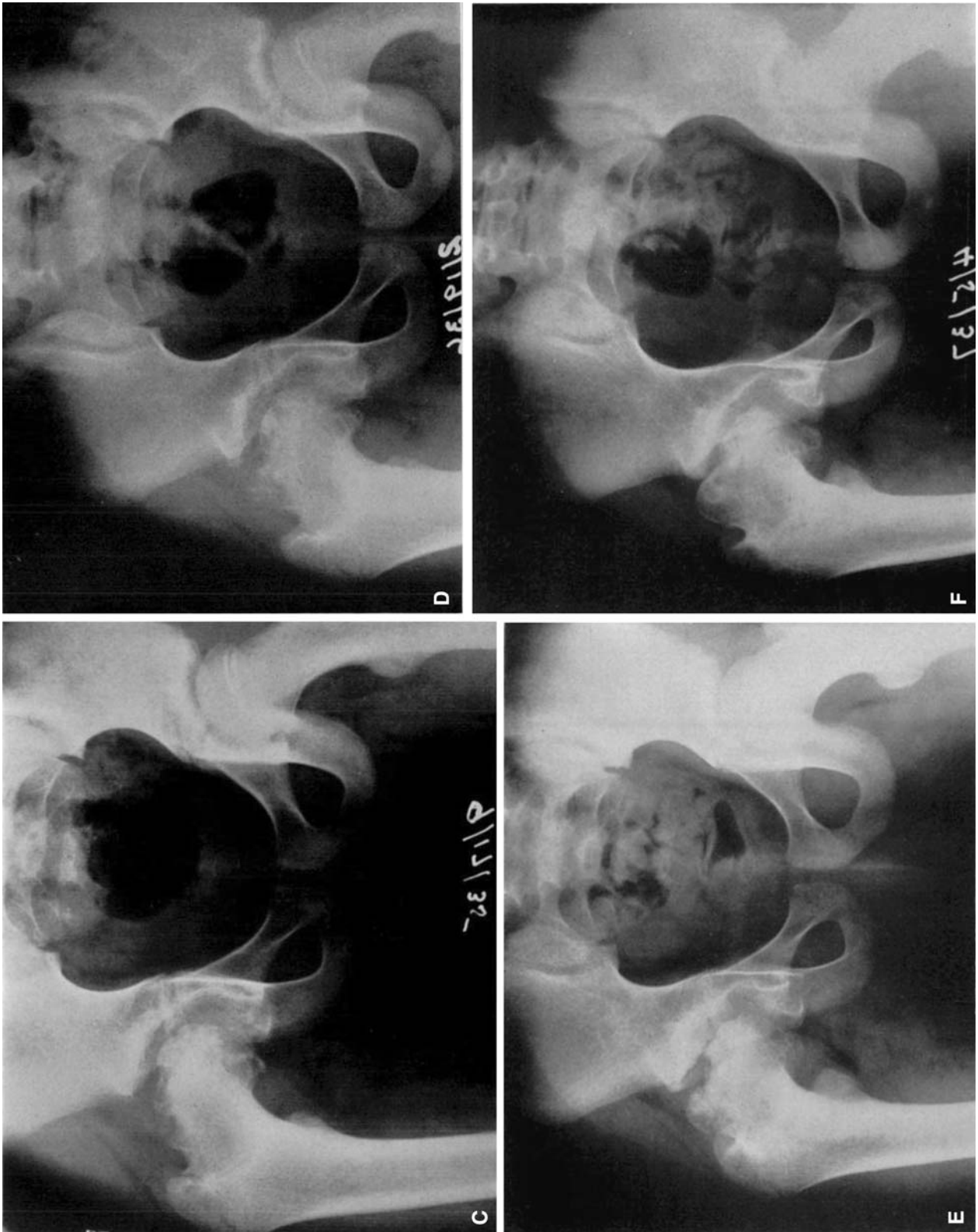


Fig. 2A–J continued.

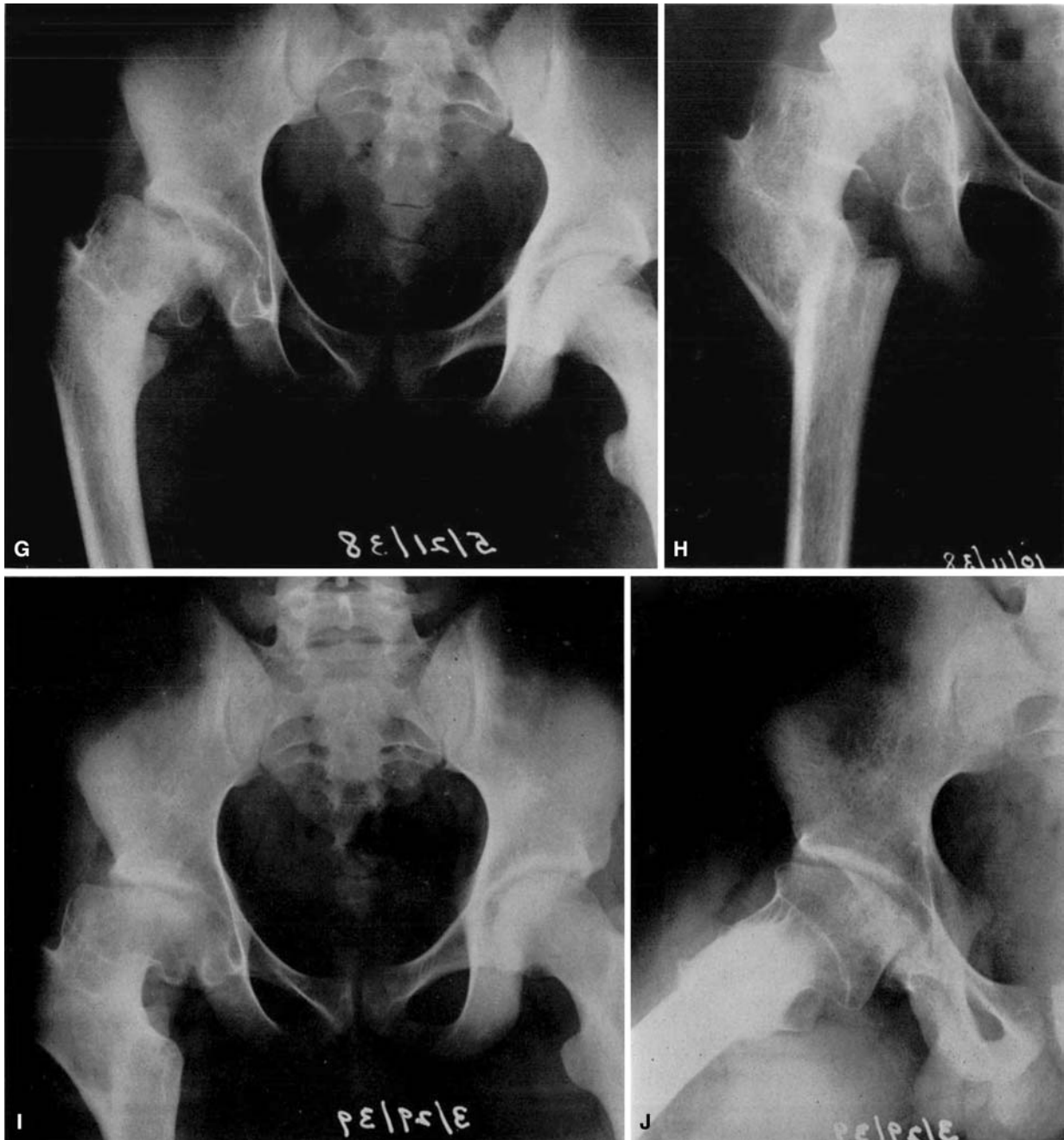


Fig. 2A-J continued.



Fig. 3A–C (A) Case 5. August 14, 1935. Fracture at the base of the neck of the left femur with some disturbance of the trochanteric epiphysis. This fracture was complicated by a fracture of both bones of the same leg, just below the knee joint. (B) Case 5. September 4, 1935, after twenty days of fixation in a plaster spica. The position is satisfactory, and repair is in evidence. (C) Case 5. January 13, 1940, four and one-half years after injury. The fracture is well healed. The

head shows evidence of disturbed circulation, and the neck is somewhat shorter and wider than that of the opposite femur. At the present time this boy has no shortening or limp. The left thigh is 4 centimeters less in circumference than the right. Internal rotation of the thigh flexed to a right angle is slightly limited. This is a good functional result.



Fig. 4A-E (A) Case 8. December 13, 1937. Fracture of the neck of the left femur in a boy, fifteen years of age. (B) Case 8. February 10, 1938. After four weeks of traction, the head was fixed with a Smith-Petersen nail. The head of the femur is now beginning to show evidence of a circulatory disturbance. (C) Case 8. September 23, 1938, seven months later than Fig. 4-B. The reduction is not good,

and the femoral head is quite dense. (D) Case 8. February 23, 1939, five months later than Fig. 4-C. The head and nail both show evidence of disintegration. (E) Case 8. June 1, 1939. Two months after injury a reconstruction operation had been done. This film, fifteen months after this last operation, shows an avascular head, and the fracture line is still visible. The result is a stiff and painful hip.

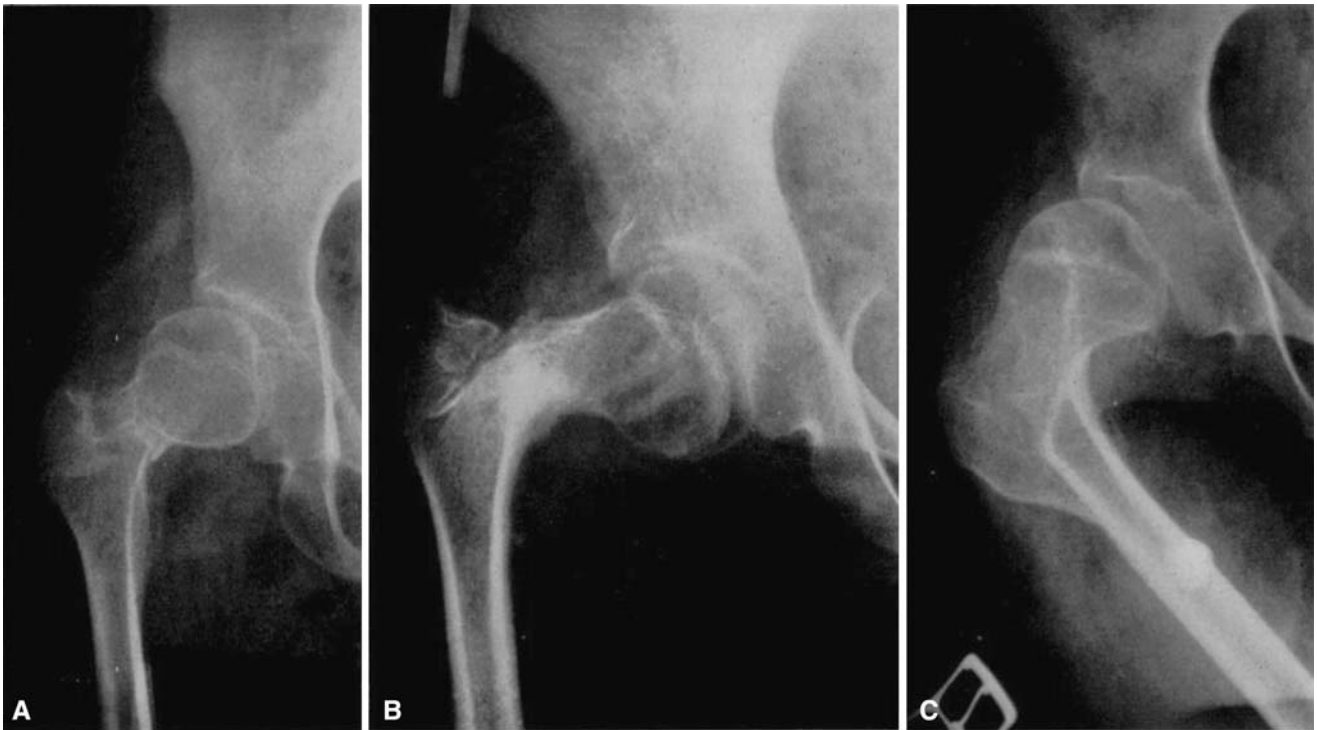


Fig. 5A–C (A) Case 9. July 15, 1938. Fracture through the neck of the right femur, with some rotation of the head, in a girl, aged twelve years, who suffered from the residual effects of infantile paralysis. She fell while walking across the floor. (B) Case 9. August 10, 1938. The leg was first placed in traction, and this film shows the beginning

coxa vara deformity. (C) Case 9. December 22, 1938. This film, taken with the leg in complete adduction in an attempt to dislocate the hip, shows to better advantage the osteotomy and healed fracture. No evidence of growth disturbance is seen in the femoral head. Further observation is warranted.

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