TRAUMATIC DISLOCATION OF THE HIP IN CHILDREN

An Analysis of Forty-seven Patients

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This paper presents the results of a study of forty-seven children under sixteen years old, each of whom had suffered a traumatic dislocation of one hip.

In 1924 Choyce reviewed fifty-nine patients, of whom one was personally observed, and in 1927 Giraud reviewed 109 patients, of whom two were personally observed, all the others being collected from the literature up to that date. Since then numerous case reports have been published. These are analysed in Table I. In addition, Thompson and Epstein (1951), Paus (1951) and Piggot (1959) have published series of these injuries, and the relevant information from these is analysed in Table II.* Table I shows that avascular change in the femoral head occurred in about one-fifth of the patients. We decided to collect from our colleagues in this country case histories and radiographs to find out the true incidence of avascular change in the dislocated femoral head of the child because we believed that previously published series may have shown considerable selection, the patients only being described in the literature because of the presence of this, or some other, complication. We deliberately kept our inquiry to patients with simple traumatic dislocation and have not included any patient in whom there was evidence of an associated fracture. Some patients had fractures in the shafts of their femora on the same side as the dislocation, or in other bones, but these were not regarded as being "associated" with the dislocation for they in no way influenced the outcome of the hip injury.

FIG. 1

The ages at which the dislocations occurred in forty-six children.
The exact age of one child was not known.

A circular letter explaining the aims of this study was sent to 340 orthopaedic surgeons in Britain. They were asked to contribute clinical and radiological details of any patients whom they had themselves treated. The replies received produced fifty patients, to which we added five of our own. An age limit of fifteen years was chosen as a reasonable dividing line between children and adults, which was the same age limit chosen by Thompson and Epstein (1951),

* Since this paper was accepted for publication a further review of the subject has been published by Morton (1959). He found 129 cases in a survey of the literature in English, and added seven of his own from the Vancouver General Hospital. His review includes children with associated acetabular or trochanteric fractures, and also central hip dislocations.

There is a further report by Haliburton, Barber and Brockenshire (1959) of a girl of seven who developed avascular changes two months after dislocation of the hip.

TABLE I
REPORTS OF TRAUMATIC DISLOCATION OF THE HIP IN CHILDREN
PUBLISHED SINCE THE REVIEW BY GIRAUD IN 1927

Author	Year	Sex	Age (years)	Side	Time between injury and reduction	Method of reduction	Length of observation	Result	Complications
Clarke	1929	F	3	L	Hours	Closed	9 months	Normal hip	None
Nicolaysen	1931	M	10	—	Unknown	Unknown	12 months	Poor	Avascular necrosis
Elmslie	1932	F	7	L	7 days	Unknown	8 months	Poor	Avascular necrosis
Glynn	1932	M	3	R	5 days	Closed	Unknown	Unknown	None
Glynn	1932	F	7	R	Hours	Closed	11 months	Normal hip	None
Meng	1934	M	5	L	15 days	Closed	2 weeks	Unknown	None
Meng	1934	M	5	L	4 weeks	Closed	8 months	Normal hip	None
Charry	1936 1937	—	7	—	2 months	Open	2 years	Normal hip	None
Haines	1937	M	6	L	Hours	Closed	4 months	Normal hip	None
Rocher, Rocher and Cuzard	1937	M	14	R	Hours	Closed	10 weeks	Normal hip	None
Cuzard	1937	M	13	R	4 days	Closed	2 months	Normal hip	None
Cuzard	1937	M	7	L	9 days	Closed	15 years	Normal hip	None
Goldenberg	1938	M	10	R	Hours	Closed	13 months	Poor	Avascular necrosis
Mutschler	1939	M	13	L	Hours	Closed	12 months	Poor	Avascular necrosis
Banks	1941	M	12	L	Hours	Closed	6 years	Good	Avascular necrosis at 15 months
Caamaño	1941	M	7	L	Days	Closed	Unknown	Unknown	Unknown
Caamaño	1941	M	7	L	Hours	Closed	6 years	Normal hip	None
Caamaño	1941	M	10	L	Hours	Closed	18 months	Normal hip	None
Caamaño	1941	F	12	L	2 years	Open	5 months	Poor	Limp
Quist-Hanssen	1945 1947	M	3	R	3 days	Closed	4 years	Poor	Avascular necrosis
Niloff and Petrie	1950	M	14	L	Hours	Closed	Unknown	Unknown	Unknown
Mason	1954	M	2	L	Hours	Closed	10 months	Normal hip	None
Hamada	1957	M	12	R	12 months	None	Unknown	Fair	Treated by osteotomy
Hamada	1957	F	9	L	5 months	None	Unknown	Fair	Treated by osteotomy
Litton and Workman	1958	M	5	L	8 days	Closed, Open at 5 weeks	3 years	Good	None

Paus (1951) and Piggot (1959). Patients observed for less than six months have been excluded, leaving forty-seven patients for analysis (Table III).

ANALYSIS OF PATIENTS

The forty-seven children available for review have been observed for an average of twenty-eight months, the shortest time being six months and the longest eight years. Eighteen of the patients were girls and twenty-nine were boys. In twenty-three the right hip was dislocated and in twenty-four the left. The children were classified according to age (Fig. 1), and although the injury occurred more often at about twelve years of age, all ages except the very youngest are represented. The dislocation in every child was posterior (Fig. 2). The mechanism of injury was very variable, and in those patients for whom full details were available, about two-thirds had received fairly trivial injuries, such as "doing the splits, slipping on ice, or tripping over in the school playground while walking." Major accidents, however, played their part, for the remaining third of the injuries occurred in traffic accidents or falls from a height.

Table IV shows that most surgeons applied traction for one to three months after reduction. Table V shows that surgeons rarely insisted on avoiding weight bearing for longer than three months after injury, and, since avascular necrosis was relatively rare, this policy was probably justified.

FIG. 2

A radiograph showing a typical posterior dislocation in a boy of four years.

TABLE II

ANALYSIS OF PREVIOUSLY PUBLISHED SERIES OF TRAUMATIC DISLOCATION OF THE HIP IN CHILDREN

Author	Number of children	Average ages (years)	Length of observation (years)	Number of hips showing avascular necrosis	Comment
Thompson and Epstein (1951)	8	6-14	9	None. One child who also had a femoral head fracture showed much new bone formation	Length of time off weight bearing had no significant effect on the result
Paus (1951)	19	4-15	15	One	No reason to change from a short period of after-treatment to months of non-weight bearing
Piggot (1959)	9	4-15	5	One at six months	No evidence that avoidance of weight bearing had prevented avascular necrosis

COMPLICATIONS

Fourteen of the forty-seven children had complications. Four showed the radiological changes of avascular necrosis in the head of the femur only, and three showed degenerative joint changes with some increase in the density of the femoral head, marked loss of joint space and acetabular lipping, which may have been the result of previous avascular

TABLE III
DETAILS OF FORTY-SEVEN CHILDREN WITH TRAUMATIC DISLOCATION OF THE HIP

Case number	Sex	Age (years)	Side	Mechanism of injury	Treatment	Result and complications
1	M	15	R	Fell off a horse	Traction for 6 weeks. Walked at 11 weeks	At 9 months hip movements restricted. Radiographs showed narrowing of joint space with osteophytic lipping
2	F	11	R	Knocked down by a pony	Traction for 11 days. Hip spica	At 5 months limp with restricted movements. Radiographs showed well marked avascular necrosis
3	M	6	R	Pushed over in playground	Hip spica for 1 month	Normal clinically and radiologically at 6 months
4	F	3½	L	Fell while skipping	Traction for 1 month	Normal clinically and radiologically at 10 months
5	M	—	L	Sledging	Referred to orthopaedic surgeon after 8 months, with the hip incompletely reduced	Fibular graft inserted. Marked avascular necrosis. Subsequent arthrodesis
6	M	13	L	Car accident	Unknown	Myositis in region of hip joint seen in radiograph at 2½ weeks after injury, with subsequent narrowing of joint space. Associated fracture of shaft of right femur and head injury. Later degenerative arthritis treated by femoral osteotomy
7	M	6	R	Pushed by a child	Traction for 4 days. Hip spica for 8 weeks	Normal clinically and radiologically at 16 months
8	M	2	L	Father fell on him	Traction for 8 weeks. Walked at 10 weeks	Normal clinically and radiologically at 5 years
9	F	12	R	Ran into car on bicycle	Traction for 3 months	Normal clinically and radiologically at 1 year
10	F	7	R	Road accident	Traction for 1 month	Normal clinically and radiologically at 3½ years
11	M	6½	L	Car accident	Reduced without anaesthesia. Traction for 1 month	Normal clinically and radiologically at 12 months
12	M	6	R	Jumped on while crouching	Hip spica for 3 weeks. Walked at 6 weeks	Normal clinically and radiologically at 10 months
13	M	13	R	Fell on right knee playing football. Another boy landed on him	Post-reduction arthrograph because of suspicion of interposition of soft parts was normal	Avascular necrosis evident at 12 months
14	M	10	L	Roller skating. Fell on left hip	Hip spica for 3 months. Off crutches at 6 months	Normal clinically and radiologically at 11 months
15	F	4	R	Tripped over sheaf of corn	3 weeks in bed	Discharged as normal at 5 months. Radiograph shows large femoral head well contained in acetabulum
16	M	13	R	Sledging	Traction for 8 weeks; crutches for a further 8 weeks	Normal clinically and radiologically at 21 months
17	F	4	L	Tripped	Reduced at 10 days, traction applied. Further radiographs showed redislocation. Further reduction 8 days later, and frog plaster worn for 5 months	Normal clinically and radiologically at 10 months. A Mongol child

TABLE III—*continued*
 DETAILS OF FORTY-SEVEN CHILDREN WITH TRAUMATIC DISLOCATION OF THE HIP

Case number	Sex	Age (years)	Side	Mechanism of injury	Treatment	Result and complications
18	F	9	L	Front seat passenger in car. Road accident	Traction for 6 weeks. Walked at 3 months	Normal clinically and radiologically at 10 months, with femoral head larger than on unaffected side. Also sustained fractures of left patella and left humerus
19	M	8½	R	Road accident. Two adults had almost identical injuries	Traction for 4 weeks	Normal clinically and radiologically at 3 years
20	F	5	R	Perhaps a fall on knees	Hip spica for 4 weeks. Walked at 6 weeks	Avascular necrosis at 3 months. Normal clinically and radiologically at 5½ years. Right femoral head slightly larger than left
21	M	12	L	Struck by railway truck	Hip spica for 1 month. Walked at 6 weeks	Normal clinically and radiologically at 14 months
22	M	13	R	Fell 30 feet	Closed reduction. 3 months later traumatic cartilaginous loose body removed	At 15 months occasional ache only. Has slight Trendelenburg dip when walking, and slightly less abductor power than on left side. Radiograph shows large head of femur, with a little raggedness of acetabulum superiorly and posteriorly. No avascular necrosis
23	M	12	L	Hit by bale	Traction for 2 months. Walked at 3 months	Normal clinically and radiologically at 3 years
24	M	11	R	Rugby injury	Traction for 5 weeks	Normal clinically and radiologically at 17 months
25	F	14	L	Fell off horse	Traction for 6 weeks. Walked at 8 weeks	Normal clinically and radiologically at 3½ years
26	F	10	R	Caught right foot falling off wall while skating	Traction for 1 week. Walked at 6 weeks	Discharged as normal at 8 months
27	M	6	L	Jumped on	Traction for 2 weeks. Walked at 1 month	Normal clinically and radiologically at 13 months
28	M	8	L	Car accident	Traction for 1 month	Normal clinically and radiologically at 18 months. Also had compound fracture of shaft of left femur
29	F	1½	R	Did the splits	Reduced after 3 days. Open operation 4 months later. Fibrous mass removed from joint. Hip spica	Walking normally at 4½ years. In original radiographs acetabulum and capital epiphysis were normal. Latest radiographs show sloping acetabular roof and large and badly contained femoral head
30	M	12	—	Unknown	Mobilised at 8 weeks. Walked at 4 months	Normal clinically at 8 years. Radiographs showed premature epiphysial fusion. Had sustained 9 other major injuries including fracture of upper shaft of femur on same side as dislocation
31	M	8	—	Unknown	Walked at 3 months	Normal hip at 2½ years. Radiograph shows trace of ossification at tip of greater trochanter
32	F	8	—	Unknown	Mobilised at 12 weeks. Walked at 14 weeks	Occasional ache in hip joint at 21 months. Radiograph shows relatively shallow acetabulum, with slight irregularity of head of femur
33	M	12	—	Unknown	2 weeks in bed. Walked at 3 weeks. Played cricket at 1 month	Normal clinically and radiologically at 7 years

TABLE III—*continued*
 DETAILS OF FORTY-SEVEN CHILDREN WITH TRAUMATIC DISLOCATION OF THE HIP

Case number	Sex	Age (years)	Side	Mechanism of injury	Treatment	Result and complications
34	F	8	L	Unknown	Immobilised for 8 weeks. Walked at 10 weeks	Normal clinically and radiologically at 6 months. Also sustained femoral shaft fracture on same side
35	M	12	—	Unknown	Traction for 3 months. Walked at 14 weeks	Normal clinically and radiologically at 5 years
36	M	14	L	Soccer injury	Hip spica for 7 weeks. Walked at 11 weeks	Normal clinically and radiologically at 21 months
37	M	11	L	Unknown	Unknown	Normal clinically and radiologically at 14 months, apart from slight enlargement of femoral head
38	M	10	L	Heavy door fell on him	Traction for 4 weeks. Walked at 6 weeks	Normal clinically and radiologically at 9 months, with trace of heterotopic bone above greater trochanter
39	M	13	R	Rugby injury	Traction for 4 weeks. Walked at 6 weeks	Normal clinically and radiologically at 20 months
40	M	6	L	Knocked down by a lorry	Traction for 3 months, and then walked	Normal clinically and radiologically at 18 months
41	F	2	R	Unknown, domestic	Traction for 1 week. Hip spica for 6 weeks	Normal clinically and radiologically at 2 years
42	F	7	R	Slipped at home	Traction for 6 weeks. Walked at 3 months	Normal clinically and radiologically at 9 months
43	M	12	L	Struck by swing	Hip spica for 6 weeks. Walked at 7 weeks	Discharged 2 months after injury. Re-appeared 3 years after injury because of limp. Radiographs showed narrowing of joint space with "fragmentation" of the head
44	M	5	L	Slipped up slope	Hip spica for 1 month, then on frame for 4 months. Walked at 6 months	Normal clinically and radiologically at 6 years
45	M	4	R	Gate fell on him	Hip spica for 2 months. Walked at 3 months	Normal clinically and radiologically at 5½ years. Had fracture of shaft of left femur
46	F	10	L	Tripped while walking and fell on left knee	Bed rest for 5 weeks. Walked at 6 weeks	Normal clinically and radiologically at 7 years
47	M	13	R	Kicked a ball playing rugby	Hip spica for 6 weeks, then on patten-ended caliper. Walked at 5 months	Normal clinically and radiologically at 3 years

change (Fig. 3). Nicoll in 1952 made a distinction between frank avascular changes and degenerative joint changes. The avascular changes mentioned appeared at times varying from three to twelve months after the injury. The degenerative joint changes also varied in the time of appearance, the earliest change showing one month after the injury. It is interesting that only one child out of twenty-six under the age of ten developed avascular change, whereas five out of twenty children aged ten or more were affected.

There was evidence of premature epiphysial fusion in only one child, but a common complication, not stressed in the previous literature, was the development of a large femoral head, and this occurred in six patients (Fig. 4); there was no common linkage, either in the mechanism of injury or the type of treatment given, with the exception that two of the six

FIG. 3

Degenerative joint changes found three years after dislocation in a boy of twelve years.

children had open reduction of the dislocation. It is possible that this may lead to osteoarthritis in later life. There is no known modification in treatment that will prevent enlargement of the femoral head.

DISCUSSION

One of the most striking observations was how often a trivial injury caused dislocation, in contrast to that required to dislocate the adult hip. There was no evidence in the radiographs of any anatomical abnormality which might account for this difference; also, the sex incidence in this series was approximately three boys to two girls, which contrasts sharply with that found in congenital dislocation of the hip, for which the figures are six to eight girls to every boy. Therefore, a congenital anatomical variant is very unlikely to be etiologically important.

TABLE IV
DETAILS OF TREATMENT GIVEN AFTER REDUCTION OF TRAUMATIC DISLOCATION OF THE HIP
IN FORTY-SEVEN CHILDREN

Bed rest only	Fixed skin traction	Plaster hip spica	Fixed skin traction followed by hip spica	Unknown
2	24	11	3	7

TABLE V
TIME BETWEEN TRAUMATIC DISLOCATION OF THE HIP AND STARTING WEIGHT BEARING
IN FORTY-SEVEN CHILDREN

Under 1 month	Between 1 and 2 months	Between 2 and 3 months	Over 3 months	Unknown
11	15	15	5	1

FIG. 4

Overgrowth of right femoral head twenty-one months after dislocation.

We were unable to find any correlation between the mechanism and severity of injury and the complications described. Boys were no more liable to complications than girls.

Treatment, in particular the time between injury and weight bearing, varied but there was no evidence that a long time off weight bearing had any effect in preventing complications. There is no point, therefore, in keeping a child off weight bearing longer than it takes for the soft-tissue injury to heal. We would suggest that four to six weeks is adequate.

SUMMARY

1. A collected series of forty-seven traumatic dislocations of the hip in children is reported and reviewed in detail.
2. All were simple hip dislocations, and no child was included in whom there was any other injury to the affected joint.
3. All were posterior dislocations.

4. No anatomical predisposition was observed.
5. Significant complications occurred in fourteen children: avascular necrosis of the head of the femur in four, degenerative joint changes in three, premature epiphysial fusion in one and overgrowth of the femoral head in six. Study of the children with these complications revealed no common cause except the dislocation itself.
6. The injury responsible was often trivial.
7. The results suggest that it is harmless to bear weight four weeks after reduction.

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REFERENCES

- BANKS, S. W. (1941): Aseptic Necrosis of the Femoral Head Following Traumatic Dislocation of the Hip. *Journal of Bone and Joint Surgery*, **23**, 753.
- CAAMAÑO, A. (1941): Luxaciones traumáticas de la cadera en el niño. *Semana Médica*, **i**, 1,450.
- CHARRY, V. (1936): Luxation traumatique invétérée de la hanche chez un enfant de sept ans et demi réduite par voie sanglante deux mois après l'accident. *Revue d'Orthopédie*, **23**, 147.
- CHARRY, V. (1937): Résultat éloigné d'une luxation traumatique de la hanche datant de deux mois et réduite par voie sanglante chez un enfant. *Bulletins et Mémoires de la Société de Chirurgiens de Paris*, **29**, 160.
- CHOYCE, C. C. (1924): Traumatic Dislocation of the Hip in Childhood, and Relation of Trauma to Pseudocoaxalgia. *British Journal of Surgery*, **12**, 52.
- CLARKE, H. O. (1929): Traumatic Dislocation of the Hip-joint in a Child. *British Journal of Surgery*, **16**, 690.
- ELMSLIE, R. C. (1932): Traumatic Dislocation of the Hip in a Child aged 7, with Subsequent Development of Coxa Plana. *Proceedings of the Royal Society of Medicine (Section of Orthopaedics)*, **25**, 1,100.
- GIRAUD, D. E. A. (1927): Contribution à l'étude de la luxation traumatique de la hanche chez l'enfant. *Theses de Bordeaux: Geof-Josp.*
- GLYNN, P. (1932): Two Cases of Traumatic Dislocation of the Hip in Children. *Lancet*, **i**, 1,093.
- GOLDENBERG, R. R. (1938): Traumatic Dislocation of the Hip Followed by Perthes' Disease. *Journal of Bone and Joint Surgery*, **20**, 770.
- HAINES, C. (1937): Traumatic Dislocation of Head of Femur in a Child. *Journal of Bone and Joint Surgery*, **19**, 1,126.
- HALIBURTON, R. A., BARBER, J. R., and BROCKENSHIRE, F. A. (1959): Avascular Necrosis of the Femoral Capital Epiphysis After Traumatic Dislocation of the Hip. *Journal of Bone and Joint Surgery*, **41-B**, 879.
- HAMADA, G. (1957): Unreduced Anterior Dislocation of the Hip. *Journal of Bone and Joint Surgery*, **39-B**, 471.
- LITTON, L. O., and WORKMAN, C. (1958): Traumatic Anterior Dislocation of the Hip in Children. *Journal of Bone and Joint Surgery*, **40-A**, 1,419.
- MASON, M. L. (1954): Traumatic Dislocation of the Hip in Childhood. *Journal of Bone and Joint Surgery*, **36-B**, 630.
- MENG, C. M. (1934): Traumatic Dislocation of the Hip in Childhood. *Chinese Medical Journal*, **48**, 736.
- MORTON, K. S. (1959): Traumatic Dislocation of the Hip in Children. *British Journal of Surgery*, **47**, 233.
- MUTSCHLER, H. H. (1939): Sekundäre Oberschenkelkopfnekrose nach traumatischer Ausrenkung des Hüftgelenkes bei einem 14 Jährigen. *Münchener Medizinische Wochenschrift*, **86**, 258.
- NICOLAYSEN, K. (1931): Malum coxae Calvé-Legg-Perthes' patogenese, belyst ved et enkelt tilfelle. *Norsk Magasin for Laegevidenskapen*, **92**, 985.
- NICOLL, E. A. (1952): Traumatic Dislocation of the Hip Joint. *Journal of Bone and Joint Surgery*, **34-B**, 503.
- NILOFF, P., and PETRIE, J. G. (1950): Traumatic Anterior Dislocation of the Hip. *Canadian Medical Association Journal*, **62**, 574.
- PAUS, B. (1951): Traumatic Dislocations of the Hip. *Acta Orthopaedica Scandinavica*, **21**, 99.
- PIGGOT, J. (1959): Traumatic Dislocation of the Hip in Childhood. *Journal of Bone and Joint Surgery*, **41-B**, 209.
- QUIST-HANSEN, S. (1945): Caput Necrosis After Traumatic Dislocation of the Hip in a 4-Year-Old Boy. *Acta Chirurgica Scandinavica*, **92**, 393.
- QUIST-HANSEN, S. (1947): Caput Necrosis After Traumatic Dislocation of the Hip Joint in a 4-Year-Old Boy. *Acta Chirurgica Scandinavica*, **95**, 344.
- ROCHER, H. L., ROCHER, C., and CUZARD, M. (1937): Luxation traumatique de la hanche chez l'enfant. *Bordeaux Chirurgical*, **8**, 255.
- SHANDS, A. R., and RANEY, R. B. (1957): *Handbook of Orthopaedic Surgery*. Fifth edition. St Louis: The C. V. Mosby Company.
- THOMPSON, V. P., and EPSTEIN, H. C. (1951): Traumatic Dislocation of the Hip. A Survey of Two Hundred and Four Cases Covering a Period of Twenty-one Years. *Journal of Bone and Joint Surgery*, **33-A**, 746.