Original Article

Chronic hip dislocations: a rarity. How should we treat them?

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ABSTRACT

Background: Chronically dislocated hips (>6 weeks) are usually the consequence of difficulties accessing appropriate healthcare in a timely fashion after dislocation; this explains why they are more common in developing countries. Due to a lack of research, there is currently no consensus on the best treatment available for patients presenting with this condition. Therefore, it is important to assess the treatments available so as to ensure that doctors adequately manage those presenting with this debilitating condition in the future.

Objective: To identify the best treatment strategy for chronic hip dislocations based on the treatment outcomes achieved by a free surgical clinic in Phnom Penh, Cambodia.

Patients and method: A retrospective analysis of the surgical centre's electronic records was conducted. Patients presenting with hips dislocated for >6 weeks were included whilst congenitally dislocated hips were excluded. Treatment outcomes, based on follow up notes, were then assessed. Data abstracted during chart review was analysed using descriptive and comparative statistics.

Results: 72 patients presented to the clinic with chronic hip dislocations. 42 patients received recorded treatment and 32 were followed up. Among patients with follow-up, 63% experienced 'good' outcomes after treatment. Open reductions, the most common treatment, were successful 65% of the time. The use of preoperative traction increased the success of open reductions by 13%, however, this result was not statistically significant ($p = 0.64$).

Conclusion: Open reductions with pre-operative traction seem to be an acceptable treatment in this setting.

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1. Introduction

Dislocated hips are treated as emergencies in developed countries. When reduction of the hip is delayed, the femoral head migrates proximally, causing a leg length discrepancy while compromising vascular supply from the foveolar artery and the anastomosis of vessels from the femoral circumflex arteries. Possible complications stemming from the delay of treatment include avascular necrosis of the femoral head, degenerative arthritis, ankylosis, and sciatic nerve injury.^{1–4} It has been shown that earlier reductions are associated with better clinical results.^{5,6}

Chronically dislocated hips (>6 weeks) are a rarity in many regions of the world where there is rapid access to healthcare; this has resulted in scarcity of recent scholarship assessing the treatments available for this condition. As chronically dislocated hips are more common in Cambodia, the aim of this study was to assess which treatment approaches provided at a free NGO clinic in Phnom Penh, Cambodia, have yielded the best outcomes for patients, in order to help guide the future practice of doctors who do encounter this problem.

2. Materials and methods

2.1. Case identification (data abstraction)

The surgical centre's Electronic Medical Record (EMR) system, which includes records from 2008, was used to conduct a retrospective analysis of patients that had presented to the clinic

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with chronic hip dislocations. Because English is not the first language of many of the surgeons, a variety of search terms were used to cover potentially misspelled diagnoses for 'hip dislocation' when searching for patients.

EMR patient histories were reviewed and only patients presenting with dislocations >6 weeks old were included in the study. This interval is greater than that used by Garrett (>72 h) in another paper considering chronically dislocated hips, however, no consistent standard exists for defining chronicity.^{7,8} Additionally, congenital hip dislocations were excluded.

The records of patients included in the study were then examined and the following data abstracted: patient demographics, injury aetiology, the time delay between dislocation and presentation, preoperative treatment approach (traction vs. none), operative treatment approach, and follow up notes.

2.2. Data analysis

Statistical analysis consisted of descriptive statistics for demographic characteristics, aetiology, delay between dislocation and presentation to clinic and treatment outcomes (patients were divided into subgroups based on the type of treatment they received for the last two).

Fisher's exact test was used to assess whether there was a difference in the sex ratio of treated patients.

A one-way analysis of variance (ANOVA) was used to detect whether the delay between dislocation and presentation to the clinic differed significantly between patients who received different treatments at the centre; closed reduction, open reduction, arthrodesis or total hip replacement (THR) were analysed. Each of these treatments had been used to treat three or more patients included in the study; this frequency of use enabled them to be selected for analysis. Post hoc ANOVA analysis was performed using Tukey's honest significance test and Bartlett's test of homogeneity of variance.

Operation outcomes, based on follow-up notes and radiographic evidence discovered during chart review in EMR, were used to compare the success of the varying treatments.

Data abstracted during chart review was insufficient to reliably stratify according to Epstein criteria, Garrett criteria, or Oxford Hip Score^{7,9,10} which the few other papers examining chronic hip dislocations have used to assess treatment outcomes. Both the Garrett and Epstein criteria used non-interval, ordinal grades.⁷ Like these scoring systems, we decided to use categorical measures to simplify outcome analysis; operative outcomes were divided into 'bad' and 'good' grades.

A 'bad' outcome was defined by presence of one or more of the following postoperatively: need for a revision operation, postoperative dislocation, a limited range of movement (ROM) significant enough to affect daily life (work/household activities), positive Trendelenburg sign or postoperative necrosis of the femur. Pain, a limited ROM not affecting daily living and long-term use of crutches were not considered bad outcomes. While these are not considered good outcomes in more developed countries where acute dislocations are treated promptly, we accepted that the chronicity of the presenting complaint prevents the same postoperative outcomes being achieved in patients in developing countries. 'Good' outcomes were defined by the absence of follow up complications that made an outcome bad (described above). The frequency of good and bad outcomes for the different treatments used was then compared.

Descriptive statistics were also used to analyse pre-operative treatment; the number of days patients spent in traction (patients were again divided into groups based on the treatment they went on to receive) and the weights used at the beginning and end of traction were examined.

A Welch two-sample *t*-test was used to determine whether the delay between dislocation and presentation differed significantly between patients with and without preoperative traction, both for all surgeries and for the restricted subgroup of patients treated with open reduction. Next, Fisher's exact test was used to determine differences in the number of good outcomes between patients with and without traction prior to open reduction. Statistical significance for all tests was defined at $p < 0.05$. All statistical analysis was performed using R version 3.1.1.

3. Results

72 patients presented to the clinic with chronic hip dislocations. The average age of these patients was 27 and a statistically significant majority (71%, $p = 0.02$) were males. The major causes of these dislocations were falls (36 cases) and motor vehicle accidents (MVA) (17 cases).

Of the 72 patients that presented, 42 proceeded to have treatment at the hospital. The average delay from dislocation to presentation for these patients was 18 months (range 6 weeks to 13 years). Ten of the patients receiving treatment were not followed up. For the 32 patients that remained, the average time from treatment (operation) to the last follow-up was 11 months (range 20 days to 39 months). Five of the 10 patients lost to follow-up had good postoperative outcomes noted in their records before discharge.

A variety of operations were used to treat the dislocated hips presenting to the clinic. Closed reductions were predominantly used for patients presenting with hips which had been dislocated for a short period of time (mean = 1.9 months) (Table 1); open reductions were used to treat hips which had been dislocated for a mean of 7.5 months longer than those for which closed reductions were used. Total Hip Replacement (THR) was only attempted as a first line treatment for hips that had been dislocated for longer periods (mean = 10 years). The delay before surgeons opted for THR was statistically significant when compared to open reduction, closed reduction, and arthrodesis using ANOVA and Tukey's range test ($p < 0.0001$). Bartlett's test of homogeneity of variance showed that the subgroup samples were non-normally distributed ($K^2 = 48$, $df = 3$, $p < 0.0001$). When Welch's *t* test was used to compare the delay to treatment between open and closed reductions, closed reduction was associated with shorter delays (-0.64 to -14.48 , 95% CI, $p = 0.03$).

Fig. 1 highlights the outcomes of the different operations used to treat the dislocated hips. The most common operations were open reductions ($n = 24$) and closed reductions ($n = 7$). If only patients for which there is follow-up data are considered, 63% of all chronic hip dislocations treated had good outcomes and open

Table 1

Table showing the delay between hip dislocation and presentation to clinic for patients receiving various forms of treatment. (Delay to presentation data for two of the seven patients treated with closed reductions could not be found in the medical records).

Treatment (operation)	Number of patients	Delay between dislocation and presentation (months)	
		Mean	Range
Closed reduction	7	1.9	1.5–2
Open reduction	24	9.4	1.5–72
Arthrodesis	4	10	5–14
THR	3	120	48–156
Hemiarthroplasty	1	11	11
Osteotomy	1	60	60
Arthroplasty	1	11	11
Bone graft	1	3	3
Overall	42	18	1.5–156

Fig. 1. Bar chart depicting the outcomes of varying treatments for chronic hip dislocations used.

reductions, the most common treatment, had good outcomes after 65% of procedures. Because operations other than open reductions were performed less often, statistical comparisons of outcomes by procedure type could not be performed.

Some patients received skeletal traction to manoeuvre the head of the femur into the acetabulum before operative treatment. On average, patients who had had traction received it for 9.9 (range 1–15) days before operative treatment; on average, a start weight of 11.0 kg (range 1–20 kg) was utilised and increased to 13.7 kg (range 2–30 kg) just before treatment. Patients receiving traction preoperatively had hips that had been dislocated for an average of one month longer (25 patients; delay to presentation average: 19 months, range: 6 weeks–5 years) than those who did not receive traction (17 patients; delay to presentation average: 18 months, range: 6 weeks–13 years) when the type of operation was not considered. This difference was not statistically significant ($p = 0.93$). However, when the individual type of operation was considered e.g. open reduction, use of traction tended to be associated with hips that had been dislocated for longer periods.

The number of patients in each treatment category and the time elapsed between dislocation and presentations are presented in Table 2. This highlights the time elapsed between dislocation and presentation tended to be higher in the subgroups treated with traction. The number of patients with good results,

bad results, and no follow-up by treatment subgroup are also presented in Table 2.

Preoperative traction vs. no traction was compared in the open reduction group only (this was the only group large enough to divide into two pre-operative sub groups). Seven of ten (70%) with traction had good results whilst 4/7 (57%) of those without traction had good results—a difference of 13% (Fig. 2). Using Fisher's exact test, traction in this group was associated with more good outcomes (OR = 1.69, 0.15–20.06, 95% CI), but this result was not statistically significant ($p = 0.6437$). Importantly, preoperative patient characteristics differed significantly between those with traction and those without. The traction group had dislocations that had been present for nearly 12 months longer (15 vs. 3.23 months). Although the sample sizes were small, this difference approached statistical significance using Welch's t -test ($p = 0.11$). Presumably, surgeons thought the pull of the muscles would not be strong in dislocations that were more recent, and surgeons would therefore be able to generate enough force to pull the head of the femur into the acetabulum during surgery. Of the 4 patients with no traction who had good results, 2 had operations one day after presenting to the surgical centre and the average time between presentation and operation was 2.75 days. It is therefore unlikely that these patients had traction that was not documented by EMR in such short intervals.

Table 2

Table highlighting the delay between dislocation and presentation for patients with chronically dislocated hips; operations are subdivided to indicate whether or not a group of patients received pre-operative traction or not. The operative outcomes of each sub group are also noted. (Delay to presentation data for two of the seven patients treated with closed reductions could not be found in the medical records).

Operation	Number of patients	Delay between dislocation and presentation (months)		Number of patients with a given result		
		Mean	Range	Good	Bad	No follow up
Closed reduction (no traction)	7	1.9	1.5–2	2	2	3
Closed reduction (traction)	–	–	–	–	–	–
Open reduction (no traction)	12	3.2	2–11.5	4	3	5
Open reduction (traction)	12	15	1.5–7.2	7	3	2
Arthrodesis (no traction)	3	8.7	5–11	–	3	–
Arthrodesis (traction)	1	14	14	1	–	–
THR (no traction)	2	156	156	2	–	–
THR (traction)	1	48	48	1	–	–
Hemiarthroplasty (no traction)	–	–	–	–	–	–
Hemiarthroplasty (traction)	1	11	11	1	–	–
Osteotomy (no traction)	–	–	–	–	–	–
Osteotomy (traction)	1	60	60	–	1	–
Arthroplasty (no traction)	1	11	11	1	–	–
Arthroplasty (traction)	–	–	–	–	–	–
Bone graft (no traction)	–	–	–	–	–	–
Bone graft (traction)	1	3	3	1	–	–

Fig. 2. Bar chart reflecting the outcomes of chronic hip dislocations treated with open reductions based on whether or not pre-operative traction was utilised.

Fig. 3 exhibits pelvic radiographs of a patient's chronically dislocated hip on presentation; post-traction, with movement of the femoral head into the acetabulum (preoperatively) and a good outcome, post-open reduction, upon follow up.

4. Discussion

4.1. Treatment options

In the developing world, treatment of dislocated hips is often delayed. In Cambodia, a marked delay in presentation is frequently due to the use of Khmer Traditional Medicine (KTM) prior to seeking western medical advice. A previous study of chronic hip dislocations in Cambodia found that 82% of 33 patients presented to a clinic providing KTM prior to seeking Western medical treatment.¹¹ Other barriers to care include lack of knowledge of free NGO medical services such as this clinic, the price transportation to access treatment, and the opportunity cost associated with time away from employment.

Therefore, this study aimed to help guide the treatment of those presenting with chronically dislocated hips in developing countries. By examining the follow-up data of patients presenting with dislocations >6 weeks old, we were able to identify the outcomes of varying treatments for chronic hip dislocations performed at the centre. Among the 32 patients with follow-up data, 63% had good outcomes. It is, however, difficult to compare the success of these operations to those considered in other studies because so few studies have documented surgical outcomes in hips that have remained unreduced for more than 6 weeks.

Historically, open reduction has been a more common approach in the developing world and is associated with acceptable outcomes. A 1999 study based on 12 late unreduced traumatic posterior hip dislocations in children in hospitals in India and Malaysia reported 11 excellent outcomes using a standard lateral open reduction after insufficient reduction with traction alone.³ Other contemporary surgeons have reported similar success with open reductions.³

Our study showed that open reductions, used most commonly to treat chronically dislocated hips at the centre, were successful 65% of the time. It is, however, challenging to compare the efficacy of this treatment to that of other operations for two reasons: (1) closed reductions were predominantly attempted on hips which had not been dislocated for as long as open reductions, and (2) other operations were not used frequently enough to obtain a large enough sample to make statistical comparison possible.

Similar to our study, previous scholarship has suffered from small sample sizes due to the relative rarity of a presenting hip with significant treatment delay. One study in the United States of

39 traumatic hip dislocations that had remained unreduced for over 72 h found that THR may be associated with more 'good' outcomes (10 of 13 hips) compared to closed or open reduction (3 of 20) and hips left dislocated (0 of 6).⁷ In our study, all 3 (100%) of hips treated by THR had good outcomes, despite these patients presenting after significant treatment delay (mean = 120 months). However, due to the low number of patients treated with THR ($n = 3$), it was not possible to compare the results of THR to open reduction.

Prostheses were not very commonly used at the centre; this is partially due to cost and the technique the centre uses to decide whether or not one is necessary. Intraoperatively, when the femoral heads were exposed at operation, they were drilled with a 3.5 mm bit and observed for bleeding. A majority of the heads bled on drilling (Fig. 4) and were deemed vascularised so fit to be reduced if possible. If they did not bleed, avascular necrosis was diagnosed, and the femoral head was replaced with a prosthesis. Sometimes, the femoral head bled but was soft and indented while trying to reduce it, producing a "ping-pong sign". In such cases, a prosthesis was also used. Acetabular replacement was only carried out if the acetabulum was damaged, but capable of being reconstructed with a prosthesis; otherwise, if the acetabulum was severely deformed, hip arthrodesis was performed or a Girdlestone arthroplasty was done.

Drilling the femoral head was used to identify avascular necrosis; bleeding obviously indicated that the head had a blood supply. However, it is perfectly possible that in the majority of cases, avascular necrosis of the head might have taken place when the dislocation was experienced; since such a long time had elapsed after injury in the majority of cases, "creeping substitution" had revascularised the head.¹² Similarly, inadvertent indentation of the head during reduction indicated osteoporosis, but whether this was due to "creeping substitution"¹² or to "disuse osteoporosis"¹³ was impossible to determine.

Postoperatively, to maintain reductions, spica cast were used for 6 weeks at the centre.

There were a variety of complications that led to 12 patients having 'bad' outcomes. The two that received closed reductions as an initial treatment were classed as 'bad' as reductions were not achievable with this initial treatment and, open reductions had to be used. The 6 'bad' open reductions had a variety of complications; post-operative dislocation (1 patient), subluxation (1 patient), impaired ROM (2 patients), substantial pain (1 patient), Trendelenburg +ve (1 patient). Two patients went on to have recorded revision operations; one due to subluxation and the other due to the surgeons not being able to reduce the hip intra-operatively (no pre-operative traction had been used). The three arthrodesis that were 'bad' had all failed to fuse. The 'bad' osteotomy was complicated with partial necrosis of the femur.

Fig. 3. Top: Pelvic radiograph of a chronically dislocated hip at presentation, three months after the causative fall. Middle: Pelvic radiograph two days after presentation. Skeletal traction with 10 kg was used. An open reduction was performed seven days after this. Bottom: Radiograph performed on follow up. This patient had a good outcome.

Fig. 4. Drilling of femoral head produces bleeding.

4.2. Pre-operative treatment

Whilst it has been shown that traction before open reduction seems to improve postoperative outcomes (70% with traction vs. 57% without), our results were not statistically significant ($p = 0.6437$) due to the small number of patients in this study. Furthermore, there is a paucity of follow-up data for a relatively large number ($n = 5$, 42%) of patients in the 'no traction' treatment group. If these patients had had outcomes, it would add more validity to the use of preoperative traction. However, it is also possible that lack of follow-up indicated a successful operation, and that more aggressive surveillance of patients would further prevent rejection of the null hypothesis. More concerning, statistically, is the difference in patient characteristics between patients treated with and without traction. The subgroup with traction presented with hips that had been dislocated for a longer mean period (15 vs. 3.23 months, $p = 0.11$), which may have predisposed them to worse outcomes due to vascular compromise, degenerative arthritis, or sciatic nerve injury. Due to these differences, our results remain equivocal.

4.3. Difficulties with follow-up data

The manner in which follow-up data was recorded in the clinic EMR was not consistent. For example, in several instances, the postoperative state of the hip and ROM were not documented. In such cases, the progress was usually noted as 'good,' so it was assumed that the patient had a good outcome that did not require further discussion. Omission of potentially relevant outcome data makes it possible that our results inflate the success of operations.

Furthermore, comparing the success of operations was complicated by low rates of follow-up and small sample sizes in treatment subgroups. To power the study and provide greater validity, a larger sample size, over a greater period of time must be studied. However, due to the relative rarity of chronically dislocated hips, it is important to publish surgical outcomes even when population sizes are insufficiently large to power comparative analysis. Few single clinics in the developing world are likely to treat enough chronically dislocated hips to achieve appropriate statistical power for comparisons across a range of treatment strategies.

Future prospective analysis of patients presenting with chronic hip dislocations may provide a more accurate reflection of a patient's journey at the clinic as it would rely less on retrospective inspection of patient records that do not always contain sufficient data to make a clear diagnosis or an assessment of outcome quality.

Moreover, it is also important to consider that the time point of the last follow up from operation varied between patients; the patients are therefore at different time points in recovery, potentially affecting outcome data. A given follow-up period may therefore be set in the future to allow for a more accurate comparison of outcomes.

Another issue was also the loss of patients to follow up; this is common in free or low-cost surgical clinics in Cambodia and the developing world. In the present study, 76% (32/42) of patients receiving surgical operations completed follow-up. Although lost patients may have introduced selection bias, 76% is an acceptable rate of follow-up given socioeconomic and geographic constraints in a low resource setting in Cambodia. Patients often lack the financial assets required to return for follow-up, which may seem less important than the surgical operation itself, especially when complications are absent. Although outcome data may be increased through aggressive post-discharge surveillance (e.g. by phone or home visits), such an approach costs time and money and preoccupies clinic staff. Furthermore, according to some research in other resource-poor settings, such a strategy would not significantly increase identification of complications.¹⁴

5. Conclusion

The data indicates that open reductions are an appropriate treatment strategy for chronically dislocated hips and that pre-operative traction is associated with better outcomes. Unfortunately, none of the results are statistically significant. Whilst chronically dislocated hips are rare worldwide, they are a common problem in the developing world and no single surgical centre is likely to have a large enough patient population to power a comparative study. Therefore, it is vital to present this work so that

it, alongside that of others, can help guide the future treatment of a condition which is debilitating for so many in the developing world.

Conflicts of interest

The authors have none to declare.

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