

Do We Need to Change Hip Spica Halfway Through Immobilization Following Closed Reduction for Developmental Dysplasia of the Hip

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Abstract

Objectives: Closed reduction (CR) is a well-established method for treating developmental dysplasia of the hip (DDH). Traditionally, the child is placed in a spica cast after DDH CR for three to four months, and it is common practice to change the spica under general anesthesia after 6–8 weeks. To our knowledge, no previous studies have shown that changing the spica is necessary. We hypothesize that there is no need to change the spica and that it can be safely retained for three months without any significant complications.

Methods: We used our department database to find all children who had DDH CR and a spica cast for a minimum of 90 days over a one-year period (March 2018 to March 2019) and who had at least a one-year follow-up after removal of the cast. We retrospectively reviewed the medical notes and radiographs, looking at complications that may be attributed to prolonged use of spica.

Results: Thirty-nine patients (48 hips) met our criteria. None of the patients developed any cast-related complications during or after removal of the spica cast. No abdominal, joint or skin complications were reported throughout treatment. At one-year follow-up, there were no complications that could be attributed to using the spica for three months.

Conclusion: Changing the spica every 6–8 weeks after DDH CR is of no benefit and exposes the infant to unnecessary general anesthesia, with the risk of losing the hip reduction. We conclude that it is very safe to keep the spica cast on for three months without changing after DDH CR. We recommend changing practice to reflect our findings.

Keywords: Hip spica, immobilization, developmental dysplasia

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INTRODUCTION

DDH is a common disorder among newborns. Once diagnosed, the baby is usually treated with conservative methods such as bracing. However, some hips fail to improve with conservative treatment, and other babies present at an older age, at which conservative

treatment is no longer possible. The next step in the management of these situations is to perform a closed reduction (CR) of the dislocated hip(s). This is performed under general anesthesia with the help of an arthrogram. If a closed reduction is possible and the hip is reasonably stable, a hip spica cast is applied in the reduced position, avoiding extreme abduction. The spica cast after DDH CR is used for a minimum of three months.

It is common practice to change the spica cast every six to eight weeks under another

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general anesthetic (GA) to check the reduction of the hips and screen them under an image intensifier; this is also done for fear of complications that may arise because of the prolonged use of the spica. These ‘possible’ complications include compression on the abdomen and hip, and knee joints, which can be anticipated by the growth of the baby inside the fixed-size cast. This may present as an intestinal obstruction picture, with abdominal pain, constipation, and repeated vomiting. Theoretical effects on joints may also include joint subluxations or dislocations, contractures, and growth arrest. Other possible complications are related to the skin under the cast or at the edges of the cast. Skin ulcerations and infections can occur, as well as lacerations at the edges of the cast due to its rubbing on the skin in these areas.

We looked at the available literature and found that most studies discussing DDH CR mention changing the spica under GA halfway through treatment. This is also mentioned in most orthopedic textbooks and in many institutional websites, such as The International Hip Dysplasia Institute; however, we found no evidence to support this practice. Therefore, in this review, we examine whether there are any drawbacks to leaving the same spica cast for three continuous months without changing in the short and intermediate terms.

METHODS

Institutional ethical board approval was obtained for this study. We used our department database and identified all babies admitted to our unit for closed reduction of the hip(s) over a one-year period (March 2018 to March 2019). We used the following inclusion criteria: closed reduction of one or both hips, application of the same spica cast for a minimum of 90 days, and a clinical and radiological follow-up at least one year after removal of the spica. We excluded patients who were found to have irreducible hips or persistent significant medial pooling; those with severe instability on arthrograms requiring extreme positions in the spica, and

those who did not have a spica and were planned for open reduction at a later date. We also excluded patients who had teratological hips and hip dislocation secondary to neuromuscular disease or arthrogryposis syndromes, etc. Thirty-nine patients (48 hips) met the above criteria and were included for analysis in this study (Table 1).

Table 1: Demographics of the cohort

Gender	6 Males	33 Females
Laterality	Unilateral 30 (17 Left, 13 Right)	Bilateral 9
Age	9.5 months (6–14)	
Time in spica	93 days (90–99)	

We looked at the medical notes, including admission notes, clinic letters, and radiology reports. We also reviewed the x-rays of these patients pre-operatively, immediately after cast removal, and at one-year follow-up. We looked for any readmissions during the casting period because of abdominal pain, fever, constipation, diarrhea, skin problems, etc. The clinic letters were reviewed for any of the above complaints. We also looked at any entries mentioning skin ulcerations, lacerations or infections at the time of cast removal and those relating to hip and knee range of movements, pain, and contracture, etc. in the follow-up visits. We also checked all the X-rays and X-ray reports to look for re-dislocation or avascular necrosis during the casting period or after spica removal up to one year after removal of spica.

RESULTS

We identified 39 patients (48 hips) who had been treated by closed reduction for DDH during this period. The average age at the time of the procedure was 9.5 months (6–14 months). All patients had had a hip arthrogram (Figure 1), adductor tenotomy for the affected hip(s), and successful closed reduction with a well-padded spica cast application under general anesthetic (Figure 2).

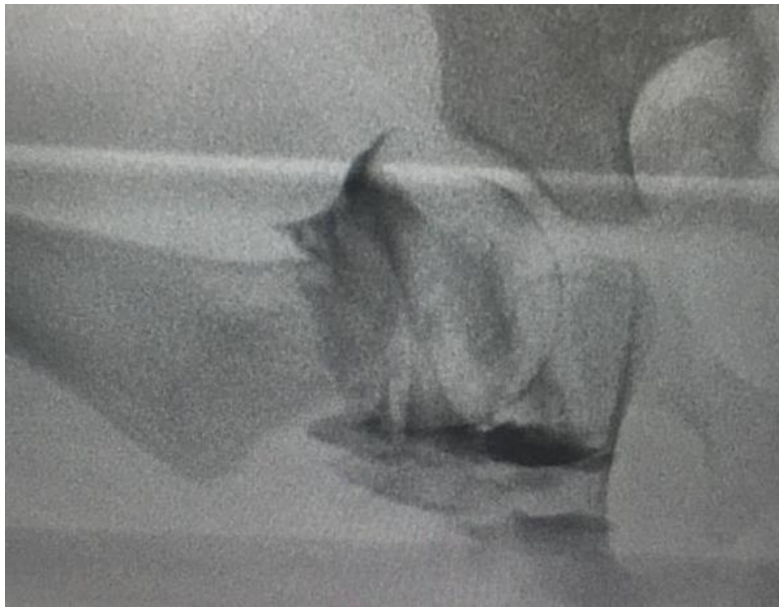


Figure 1: Intra-operative fluoroscopic arthrogram image showing reduced hip with no medial pooling of the contrast



Figure 2: Double hip spica applied after closed reduction with good padding all around

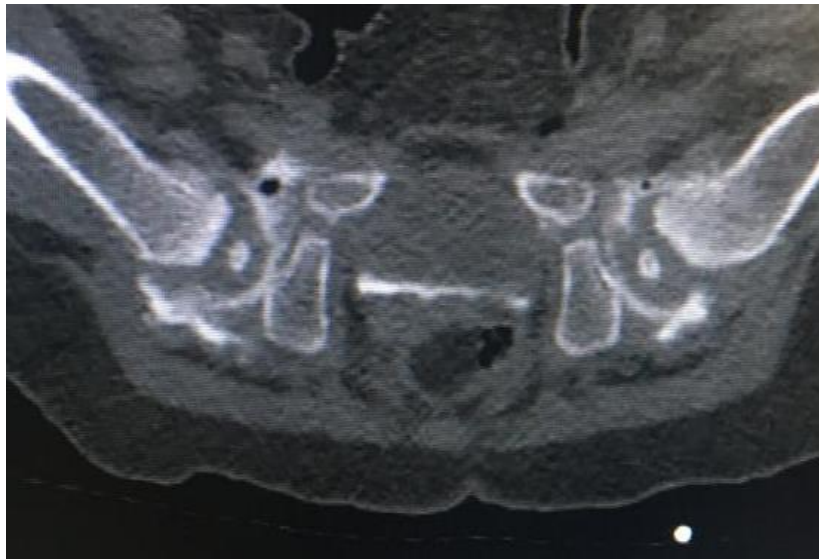
All patients had a full-length double hip spica from the rib cage to just above the ankles. The spica casts were well padded with multiple layers of cotton wool. Extra padding was used around the edges of the spica, especially at the upper end and in the groin and buttock areas. We made sure that there was enough space around the abdomen and to fit nappies under the

cotton wool layer all around. Plaster of Paris was initially used and the casts were molded over the greater trochanters of the affected hip(s) to protect the reduction. Additional layers of fiberglass casting material were used on top to strengthen the spica. No broomstick was used in any patient.

All patients had a CT scan post-operatively

to check the reduction. All affected hips were found to be reduced on the CT images (Figure 3). All patients were discharged on the day of procedure. All families were instructed to seek immediate medical attention if the child developed any signs of intestinal obstruction 'spica syndrome', skin lacerations or ulcerations under the spica or around its edges

etc. Parents were given instructions about dealing with the spica, nappy changes, and hygiene. In particular, it was explained and demonstrated to parents how to change nappies to avoid soiling the spica by having the nappy under the cotton wool layer at the front and back and the groin area.



A. Axial CT image



B. Coronal CT image

Figure 3: Post-operative CT scan showing reduced hips: A. Axial and B. Coronal cuts. Note that the contrast material from the intra-operative arthrogram is still in the joint and helps visualization of the femoral head and acetabular margins, and with checking the reduction on the CT images

The first follow-up visit was at six weeks post-op to check the spica and obtain x-rays. None of the families reported any issues with the spica and none of the patients developed abdominal pain vomiting or constipation. On examination, there was still enough space between the abdomen and the spica cotton wool in all patients. No skin problems were found in any patients. x-rays were obtained of all patients on this visit showing maintained reduction in all patients, taking into consideration the limitation of x-rays with the spica cast in situ. All patients were given another appointment at three months post-op with the same instructions mentioned above.

At the three-month appointment (minimum 90 days in the spica), all patients had their casts removed. None had any skin laceration, ulceration or infection under the spica. Most patients had dry skin, which is expected at this stage. Repeat x-rays were performed of all patients showing maintained reduction in all cases. A hip abduction splint was prescribed full time for six weeks and then at night-time only for another six weeks.

All patients were routinely reviewed at timely intervals and all had at least a one-year follow-up from the date of spica removal. At the one-year follow-up, all patients had reduced hips clinically and radiologically with full and symmetrical range of hip and knee movements. All patients were already walking at this stage with a normal gait for age. No re-dislocations were found in our cohort. Three patients (7.6%) had signs of avascular necrosis (AVN), which is comparable to rates of AVN after DDH CR in the literature. All patients remain under follow-up until skeletal maturity as per our previous protocol for DDH CR.

DISCUSSION

Closed reduction and spica application for DDH is a very common procedure performed under general anesthesia. The duration of the hip spica is between 3–4 months in most studies. It is common practice to change the spica every 6–8 weeks under another general anesthesia [1–4]. In studies that used the spica for three months, the spica was changed after

six weeks [3, 4] and in those which used the spica for four months it was changed after eight weeks [1, 2]. One study assessed the use of a dynamic cast that does not include the pelvis but also changed the cast under GA after six weeks [5].

To our knowledge, there are no studies in the literature that used a spica for three months without change after DDH CR. The reason for this change of spica half-way through treatment is not clear. One possible reason may have been to accommodate the child's growth, leading to joint and abdominal complications [6] or to avoid skin complications [7]. A review of practice in one paper mentioned that the spica can be safely retained for three months, but gave no citation [8].

A study of open reductions for DDH compared short term spica immobilization for four weeks vs. a three-month spica on hip stability and AVN rates incidentally found two out of 24 patients in the second group to have skin ulcers at the time of spica removal, but these healed with simple conservative treatment [9].

Some papers discussed the possible complications of spica treatment for femoral fractures in children [7, 10]. Of these, 4–8% of their patients required spica change for skin problems. Younger age was associated with increased skin problems, most of which were secondary to soiling the spica. Other non-cutaneous complications were reported.

Complications related to prolonged use of spica after DDH CR have not been reported before. Our study showed that it is safe to retain the spica for three continuous months without effects on skin, joints or abdomen and without long-term effects on the stability of joints or AVN rates. A meticulous technique of spica application is mandatory, alongside special attention to padding at risk areas. Also, parental education and training in the protection of the spica from soiling is of paramount importance in protection against skin complications. We recommend changing the current practice and retaining the spica cast for three months without changing after DDH CR, thus saving these infants a second, unnecessary, general anesthetic.

The authors have no disclosures or conflicts of interest related to this study.

The study was conducted in Prince Hamza Hospital, Amman, Jordan.

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HIGHLIGHTS

- A spica cast is commonly changed half-way through the immobilization period after DDH closed reduction.

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هل هناك حاجة لتغيير البنطال الجبسي بعد نصف المدة اللازمة للثبتي بعد عمليات الرد المغلق لخلع الورك التطوري

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المخلص

الخلفية والأهداف: يثبت الورك ببنتال جبسي لمدة ثلاثة إلى أربعة شهور بعد الرد المغلق لخلع الورك. وجرى العادة أن يتم تغيير الجبس تحت التخدير العام بعد انقضاء نصف هذه المدة. ولا توجد أي دراسات تناقش الحاجة لتبديل الجبس و يعتقد الباحثون أنه لا داعي لتغيير الجبس و يمكن تركه لثلاثة شهور بدون تغيير .

المنهجية : تم الرجوع للملفات لتحديد جميع المرضى الذين أجري لهم رد مغلق مع بنتال جبسي لمدة لا تقل عن 90 يوماً خلال فترة عام كامل (آذار 2018- آذار 2019) و الذين تمت متابعتهم لعام كامل بعد فك الجبس و تمت دراسة الملفات بشكل راجع لتحديد أي مضاعفات للاستخدام المطول للبنتال الجبسي .

النتائج: وُجد 39 مريضاً (48 مفصل) ممن أجري لهم رد مغلق خلال هذه الفترة. لم توجد اي مضاعفات على الجلد و المفاصل والامعاء بسبب استخدام الجبس لثلاثة شهور متواصلة خلال او بعد فترة الثبتي و لحد سنة كاملة بعد فك الجبس .

الاستنتاجات : تغيير الجبس بعد 6-8 اسابيع ليس له داعي و يُعرض الطفل لتخدير اضافي غير مبرر و قد يؤدي لعدم ثبات المفصل. وأن استخدام الجبس المتواصل لمدة ثلاثة شهور آمن و ليس له اي مضاعفات على المدى القصير و الطويل. ويوصي الباحثون بتغيير النهج المُتبّع حالياً و تبني نتائج هذه الدراسة.

الكلمات الدالة: البنطال الجبسي، الرد المغلق، خلع الورك، خلع الورك التطوري، خلل التنسج.