Applying a Hip Spica in a Child

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Abstract

Hip spica cast is a useful modality for the lower limb immobilization in children with hip and femur pathologies. Single, one and half, double limb spica cast may be applied depending on the indication. The position of hip immobilization is also dependent on the underlying pathology for which the spica is being applied. The inguinal region and knee are potential weak spots in a spica and these should reinforce during spica application. Potential complications include plaster sores, breakage, avascular necrosis of femoral head (in developmental dysplasia of hip), neurovascular compromise, and superior mesenteric artery syndrome (very rare). Careful attention to technique and vigilant after-care is necessary to prevent these complications.

Keywords: Hip spica cast, Pediatric femur fracture, Closed reduction, DDH

Introduction

Hip spica plaster cast is a commonly used method for immobilization of the pelvis, hip joint, and femur in various conditions including:

- Developmental Dysplasia of Hip (DDH)
- Fracture femur (6 months to 5 years age group)
- Post-surgical immobilization in osteogenesis imperfecta, Perthes' disease, cerebral palsy, infections of the hip joint and femur, etc.

In this narrative review, we outline the types, materials required, application techniques, post-application care, and complications of hip spica cast.

Types

Hip spica casts are of following types:

1. One and half hip spica:

One and half hip spica immobilizes the ipsilateral hip, knee, and contralateral hip. This is the most commonly used type of spica cast.

2. Double hip spica:

Double hip spica immobilizes both hips, knees and is applied in bilateral pathologies.

3. Walking hip spica:

Walking hip spica cast immobilizes the ipsilateral hip, knee and ankle. It is used for immobilization of low energy, length stable femur fractures in 6 months to 5 years age group.

Application Techniques

Materials Required

1. Stockinette (cotton fabric) – -2 sizes Trunk and limb
2. Soft roll (Cotton)
3. POP plaster rolls
4. Fibrecast casts
5. Water
6. Scissors
7. Hip spica - wooden plank.
8. Bandages/folded fabric sheet for padding.

Position of Patient

For application of hip spica, the child is most commonly positioned on a wooden plank. Some centrecenters use a specially designed hip spica frame for the purpose. When using the wooden plank, the child is placed under general anaesthesia with upper torso up to dorso-lumbar spine junction on the operating table. The lower body is supported on the wooden plank which is slid underneath the child's buttock with inferior edge of the plank at the level of the child's perineum (Fig. 1). An assistant standing at the foot end of the table holds the lower limbs in desired position of immobilisation.

Position of Immobilisation

The position of immobilisation may vary according to the purpose for which the hip spica cast is being applied:

- Developmental Dysplasia of the Hip (DDH): Following closed reduction of DDH, the hip joint is immobilized in 90 to –100° degrees of flexion, 45 °degrees abduction and neutral rotation. In this

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Figure 1: Patient positioning for hip spica cast.

case, care should be taken to avoid forced excess abduction as this may result in avascular necrosis of the femoral head. Cases where abduction more than 45° degrees is needed to maintain reduction should undergo surgical intervention.

• Fracture femur: Position of hip immobilization in fracture femur varies according to location of fracture:

• Proximal third fractures: 45 °degrees flexion, 30 °degrees abduction, 20 °degrees external rotation.

• Middle third fractures: 30 °degrees flexion, 20 °degrees abduction, 15 °degrees external rotation.

• Distal third fractures: 20 °degrees flexion, 20 °degrees abduction, 15 °degrees external rotation.

The walking cast which is a single leg cast can be safely used for length stable low energy femur fractures and have been shown to significantly improve patient and caregiver comfort without increase in rates of malunion or shortening.

Steps of Application

• The first step is placement of a folded towel which extends from the xiphisternum, over the abdomen and inferiorly till the perineum. This towel serves the dual purpose of (1) providing padding to avoid tightening of the cast around the abdomen and (2) to protect the genitals during cast application (Fig. 1).

• A stockinette is applied over the trunk extending from nipple line superiorly to the inferior gluteal fold posteriorly and inguinal region anteriorly. Smaller stockinette is rolled across the entire affected lower limb and opposite thigh with partial overlap at inguinal region. A cotton roll is then applied over the stockinette (Fig. 2).

• The first layer of Plaster of Paris cast is applied. The pelvic part extends from the xiphisternum superiorly to the suprapubic region inferiorly. Care must

Figure 2: Application of cotton roll.

be taken to avoid excessive pressure. The extent of plaster inferiorly should be just above the PSIS posteriorly and pubic tubercle anteriorly. In the inguinal region, the cast is rolled in figure of 8 configuration (Fig. 3). The thigh and leg portion is then applied.

• The inguinal region and knee are commonest sites of spica breakage and hence reinforcement of these regions is of great importance. We reinforce these weak spots with plaster slabs as originally described by Kumar (1981)[3]. The inguinal region is reinforced with 10 layered plaster slabs which extends from the superior edge of the pelvic portion of the cast, to the inguinal region, and then loops around the posterior aspect of proximal thigh. The same is repeated on the opposite side keeping care of adequate perineum room and soft roll

Figure 3: Application of first layer of plaster roll.

Figure 4: Reinforcement of pelvic and inguinal portion with plaster slabs. Inguinal slabs (red arrows). Some authors apply an additional transverse slab (green arrow) to lock the inguinal slabs.

Figure 5: Reinforcement of knee with anterior plaster slab

Figure 6: After application of fiberglass cast and diaper.

padding medially (Fig. 4). Some authors apply an additional transverse plaster slab to lock the two inguinal slabs and reinforce the pelvic part of the cast.

• The knee joint is additionally reinforced with an anterior plaster slab (Fig. 5).

• The spica is strengthened by applying a layer of fiberglass plaster at the end of the procedure (Fig. 6). Patient is shifted back entirely onto the table. The plank and abdominal padding is gently removed by sliding it slowly proximally. All the edges of plaster are checked for adequate padding and any sharp edge is trimmed with plaster cutter. We recommend using double diaper protection of spica (Fig. 6). A smaller sized diaper is applied covering the perineum region over the skin and inside the plaster space. A larger sized diaper is applied over the perineum from outside. The skin smeared with plaster is wiped clean with saline soaked gauze piece. Distal circulation is checked before reversal of anaesthesia.

Plaster Care

• Parents and family are counseled regarding the importance of hygiene and use of Diaper. Soiling of the cast with urine/faeces should be avoided.

• Red flag signs of tight plaster are explained.

• Positioning of child: Frequent change in position is advised. In supine position, a pillow should be placed under the lower limbs. This is to prevent anterior tilt of the superior edge of the plaster which can impinge on the skin of the lower back leading to plaster sores.

• Free toe and limb movements and capillary refill are to be monitored.

• Sharp edges of the plaster cast should be monitored for plaster sores.

• Family should be asked to report immediately in case of excess crying, plaster soakage, fever, plaster breakage, plaster sores, nausea, vomiting, etc.

Complications

• Plaster sores

• Plaster breakage

• Neuro-vascular compromise

• Compartment syndrome

• Avascular necrosis: This complication occurs in DDH, if the joint is immobilized in excess forced abduction.

• Superior mesenteric Artery "Syndrome" is a rare but potentially devastating complication caused by obstruction over third part of duodenum. This presents with nausea, vomiting, early satiety, and abdominal pain. Family should be asked to immediately report back in case of these symptoms.

Conclusion

Hip spica cast is an extremely useful immobilization method for hip and femur pathologies in the pediatric age group. However, proper technique and attention to detail are essential. Complications can occur and should be watched for in the post application period.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflict of Interest: NIL; **Source of Support:** NIL

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