

# Developmental Dysplasia of Hip Screening Using Ortolani and Barlow Testing on Breech Delivered Neonates

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## ABSTRACT

**Introduction:** We conducted this study to compare the specificity and sensitivity of the Ortolani and Barlow tests performed by dedicated examiners, and to ascertain the incidence of developmental dysplasia of the hip (DDH) in breech babies. **Methods:** A dedicated examiner underwent specific training and testing by a paediatric orthopaedic surgeon. Routine examiners were medical officers who had basic training in medical school and were briefly trained by their superiors. The dedicated examiner examined 170 babies. Thirty babies including 5 babies with positive tests (according to the dedicated examiner) were examined by a blinded routine examiner. Results of Ortolani and Barlow tests on 30 babies were compared with ultrasound examination by blinded radiologist. **Results:** Five babies had positive Ortolani and Barlow tests. The routine examiner did not detect positive Ortolani and Barlow tests. **Conclusion:** The incidence of positive Ortolani and Barlow tests among breech babies was 2.8%. Result of Ortolani and Barlow tests by dedicated hip screener were better than results performed by routine examiner.

## Key Words:

*Ortolani and Barlow, Dedicated Examiner, Routine Examiner, Breech, Ultrasound*

## INTRODUCTION

Barlow provocative manoeuvres attempt to identify a dislocatable hip adduction of the flexed hip with gentle posterior force while Ortolani manoeuvres attempt to relocate a dislocated hip by abduction of the flexed hip with gentle anterior force<sup>1,2</sup>. Neonatal clinical screening method using the Ortolani and Barlow test is intended to decrease the rate of late detection of developmental dysplasia of the hip (DDH), however systemic literature review did not show a

consistent benefit in this regard<sup>3</sup>. Therefore few screening protocols suggested in the literature include clinical examination by few examiners or ultrasound screening. On the other hand, repeated or forceful Ortolani and Barlow may lead to hip dislocation<sup>4</sup>, while performing ultrasound screening on every baby would be associated with high cost and unnecessary treatment<sup>5</sup>. Others propose ultrasound in selected high-risk babies. This is still not possible in some centers due to financial constraints and problems with availability of an expert radiologist.

Ortolani and Barlow testing has been shown to have higher sensitivity when used by experienced examiners<sup>6,7</sup>. We conducted this study to assess the difference in efficacy between trained examiners and routine examiners in performance of clinical neonatal hip screening. We used a sample of breech babies since breech babies are known to have higher incidence of DDH. This also represented an opportunity to study the pattern of DDH occurring in breech babies in our population.

## MATERIALS AND METHODS

This was a cross-sectional study, conducted at Raja Perempuan Zainab II (HRPZ II), Kota Bharu and Hospital Universiti Sains Malaysia (HUSM), Kubang Kerian, Kelantan and was approved by Ethical Committee of both institutions. Full term babies with breech presentation regardless of mode of delivery were included in the study. Babies with neuromuscular disorder, myelodysplasia or arthrogryposis were excluded from the study.

Before the study took place, a dedicated examiner (DE) was trained to perform the Ortolani and Barlow test by an experienced Paediatric Orthopaedic Surgeon (POS) on 10 babies. The POS and DE later separately performed the same test on 30 babies. They obtained similar findings.

**Table I:** Comparison between Clinical examination (Ortolani and Barlow) dedicated examiner and ultrasound

Ortolani and Barlow	Ultrasound positive	Ultrasound negative	Total
Test positive	4	1	5
Test negative	2	23	25
Total	6	24	30

**Table II:** Comparison between Clinical examination (Ortolani and Barlow) by ward Medical officer and ultrasound

Ortolani and Barlow	Ultrasound positive	Ultrasound negative	Total
Test positive	0	0	0
Test negative	6	24	30
Total	6	24	30

Having gone through the training, the DE examined 180 babies delivered with breech presentation on working days were screened within one week of birth. Thirty neonates delivered through breech presentation (including all babies who tested positive according to the DE) were also examined by a blinded ward doctor. These 30 babies also underwent ultrasound examination using the Graf technique<sup>8</sup> by a blinded radiologist; this was used as the gold standard. Babies who screened positive were referred to the paediatric orthopaedic unit of the respective hospital for further management.

**RESULTS**

Out of the 180 babies examined by the DE using the Ortolani and Barlow method, 118 (65.6%) were female and 62 (34.4%) were male. Birth weights ranged from 2.10-4.50kg with a mean of 3.1 kg (SD: 1.53). Fifty-three (29.4%) babies delivered via spontaneous vaginal delivery whereas 127 (70.6%) delivered via lower segment Caesarean section (LSCS).

The dedicated examiner reported positive Ortolani and Barlow tests in 5 out of 180 babies (2.4%). Four of these were female whereas one was male. Four out of 5 occurred on the left hip. All were delivered via LSCS.

Among 30 subjects, the blinded ward doctors did not report any positive Ortolani and Barlow test. The blinded radiologist reported unstable hips by ultrasound in 5 infants with positive Ortolani and Barlow tests and one who had negative Ortolani and Barlow test according to the DE (Table I and II). The sensitivity of clinical examination (Ortolani and Barlow) by trained examiner was 0.667 (95 % CI: 0.284, 1.000) while its specificity was 0.958 (95%CI: 0.880, 1.000). However, the specificity and sensitivity could not be calculated in the second group because there was no positive case was detected (Table II).

**DISCUSSION**

Finding according to the Ortolani and Barlow tests have been shown to vary between different examiners<sup>9</sup>. The present study showed that properly trained personnel perform these tests more reliably. Other studies reported that Ortolani and Barlow sensitivity will improve with experience of examiner<sup>6,7</sup>. For proper Ortolani and Barlow technique, the baby must be in a relaxed condition, the proper manoeuvre must be used, and the examiner must have the ability to differentiate ‘click’ or ‘clunk’.

Ultrasound has been chosen as the gold standard as its reliability was high in normal hip and moderate in abnormal hip<sup>10</sup>. Plain radiograph and CT scan do not adequately assess cartilaginous hip in the neonate and MRI requires general anaesthesia to keep the neonate still during the examination.

The poor sensitivity for the Ortolani and Barlow methods may also contribute to false negative in turn meaning low detection rates. Sensitivity of Ortolani and Barlow tests by a dedicated examiner in this study was 0.67, which is lower than 0.87 reported in another study<sup>6</sup>. However the sensitivity is known vary widely. The specificity of 0.96 was comparable to 0.98- 0.99 in other study<sup>6</sup>.

A good screening method should have high sensitivity, be easily reproducible, easy to perform and inexpensive. Ortolani and Barlow testing only met two of the above criteria. Therefore there has been those with the opinion that ultrasound should be used as part of the screening procedure. However, it may not be cost effective to perform on all babies as incidence of DDH is generally very low. Therefore we propose that ultrasound examination should be performed on babies at high risk of developing DDH such breech presentation, compact pregnancy, or those with family history of DDH. In some countries, even selected ultrasound may not be possible due to high cost or limited availability of radiological experts and equipment. To improve diagnosis, paediatric orthopaedic surgeons or paediatricians

need to be trained to do conduct ultrasound screening. This study had shown that dedicated examiners should be trained to perform the Ortolani and Barlow test to improve rates of early detection of DDH.

Breech presentation in a neonate is a risk factor for DDH<sup>11,12</sup>. We chose this population of patients to study the efficacy of clinical screening method by two types of examiners to increase the chance of finding positive Ortolani and Barlow tests. In this study, the dedicated examiner, who had undergone a validated training process, screened 180 babies, which comprised 66.9% of all breech delivered babies at these institutions during the study period.

Incidence of positive Ortolani and Barlow tests was 2.4 % of breech babies in this study in which 70% of cases were delivered through LSCS. Fox et al reported hip dysplasia in 4.7% of breech babies delivered vaginally and 1.1% in breech babies delivered through elective LSCS<sup>13</sup>. In 2005, Lowry CA *et al* reported that the incidence of DDH was 8.11% (15 of 185) after vaginal delivery and 3.69% (19 of 515) following elective LSCS<sup>14</sup>. Both studies did not find significant difference between vagina delivery and emergency LSCS. Ultrasound was used to examine the hips in these studies. Significant increases in intra-partum pressure could be the cause of higher incidence in the Fox

and Lowry studies. Fox et al found no statistical difference in the incidence of dysplasia between elective (8.4%) and emergency (8.1%) Caesarean sections<sup>13</sup>. In our study, we could not differentiate results, as our study samples were small.

One must be aware that the assessment for DDH was performed within the first week of life. It is known that this instability may resolve spontaneously with growth. Therefore the rates in this study may not indicate the true incidence of DDH in this study population. In this study all hip instabilities were referred for treatment, therefore we could not differentiate the cases that did and did not resolve spontaneously. Long term follow-up of cases with negative Ortolani or Barlow tests were not included in the study, therefore we do not know the incidence of false negatives.

## CONCLUSION

Clinical screening with Ortolani and Barlow testing on neonate require proper training. The incidence of positive Ortolani and Barlow tests when conducted by a trained examiner on neonates with breech presentation during the week of life was 2.8%.

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