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## Review article

# Congenital dislocation of the hip: Optimal screening strategies in 2014



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## ABSTRACT

A prospective multi-centre nationwide study of patients with congenital dislocation of the hip (CDH) diagnosed after 3 months of age was conducted with support from the French Society for Paediatric Orthopaedics (*Société Française d'Orthopédie Pédiatrique* [SoFOP]), French Organisation for Outpatient Paediatrics (*Association Française de Pédiatrie Ambulatoire* [AFPA]), and French-Speaking Society for Paediatric and Pre-Natal Imaging (*Société Francophone d'Imagerie Pédiatrique et Prénatale* [SFIPP]). The results showed inadequacies in clinical screening for CDH that were patent when assessed quantitatively and probably also present qualitatively. These findings indicate a need for a communication and educational campaign aimed at highlighting good clinical practice guidelines in the field of CDH screening. The usefulness of routine ultrasound screening has not been established. The findings from this study have been used by the authors and French National Health Authority (*Haute Autorité de Santé* [HAS]) to develop recommendations about CDH screening. There is an urgent need for a prospective randomised multi-centre nationwide study, which should involve primary-care physicians.

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In 2011, the French Society for Paediatric Orthopaedics (*Société Française d'Orthopédie Pédiatrique* [SoFOP]) reported the results of a prospective multi-centre study of patients with congenital dislocation of the hip (CDH) diagnosed after 1 year of age [1]. To further refine the analysis, another prospective multi-centre nationwide study was conducted in patients with CDH diagnosed after 3 months of age, with support not only from the SoFOP but also from community-based paediatricians (French Organisation for Outpatient Paediatrics, *Association Française de Pédiatrie Ambulatoire* [AFPA]) and from radiologists (French-Speaking Society for Paediatric and Pre-Natal Imaging, *Société Francophone d'Imagerie*

*Pédiatrique et Prénatale* [SFIPP]). The results reported in this article were used by the authors and French National Health Authority (*Haute Autorité de Santé* [HAS]) to develop recommendations about CDH screening.

The objective of this article is to report the findings from the various surveys reported at the latest SoFOP symposium (14 November 2013) and to provide an overview of the HAS recommendations, which have been available online at <http://www.has-sante.fr/> since early 2014.

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<sup>1</sup> By Philippe Wicart and Christian Morin.

<sup>2</sup> We are grateful to the SoFOP members working in French institutions for their massive participation, which ensured the collection of comprehensive data for this study. We thank the SoFOP members in Belgium and Switzerland who responded

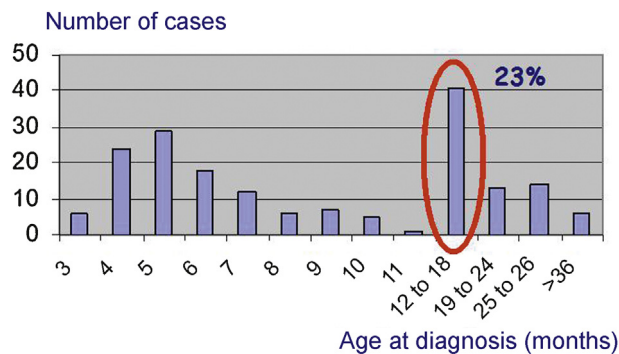


Fig. 1. Number of cases of congenital dislocation of the hip diagnosed according to age.

## 1. Distinctive features of congenital dislocation of the hip diagnosed after 3 months of age<sup>1,2</sup>

### 1.1. Introduction

The objective of this study was to determine whether a population of patients with congenital dislocation of the hip (CDH) diagnosed late, after 3 months of age, exhibited distinctive features compared to the general population and to patients included in an earlier study of CDH diagnosed after 1 year of age [1].

### 1.2. Material and methods

A prospective study was conducted among SoFOP members to identify patients with CDH diagnosed after 3 months of age, between May 2012 and April 2013, and requiring admission for closed or surgical reduction.

### 1.3. Results

The study involved 35 centres, which included 182 patients (208 dislocated hips), 20 boys and 162 girls (male/female ratio: 0.11). The dislocation was bilateral in 26 (14%) patients. The right hip was involved in 105 (50.5%) cases and the left hip in 103 (49.5%) cases. Mean age at diagnosis was 12.7 months (range: 3–78 months) with a frequency peak between 12 and 18 months, i.e., during walking acquisition (Fig. 1). The incidence of CDH diagnosed after 3 months of age among patients born in 2012 was 0.1/1000. For 44 (24.2%) hips, the assessment identified a risk factor for CDH (breech presentation, CDH in a first-degree relative, or other postural orthopaedic abnormality such as genu recurvatum or congenital torticollis).

Ultrasonography of the hips had been performed in 23 (13%) patients, at 1 month ( $n=19$ ), 2 months ( $n=3$ ), or 4 months ( $n=1$ ) of age. A radiograph had been obtained for 138 (76%) patients, including 72 who had this investigation performed between 4 and 6 months of age. The treatment consisted in closed reduction for 136 (75%) hips and/or surgical reduction for 102 (56%) hips. Mean hospital stay length per patient was 19 days (range: 1–75 days), with a total of 3575 hospital days, indicating a cost of about 3.5 million Euros.

### 1.4. Discussion

Compared to the data from the earlier study conducted in 2011, we found no differences regarding the sex ratio, CDH characteristics

<sup>1</sup> to this survey; their data were not included in this national study but were similar to those collected in France.

(side and frequency of bilateral involvement), proportion of diagnoses established after 1 year of age, or risk factor prevalence [1]. These results suggest that the same causes produce the same effects, with uncorrected gaps in screening generating a similar number of missed diagnoses in closely similar populations of infants. Our study highlights inadequacies in CDH screening, which are clearly illustrated in Fig. 1 by the peak age at diagnosis of 12–18 months. Although CDH is usually clinically obvious at this age, the diagnosis was established only when the parents asked their physician for advice after noticing a limp when their child started to walk.

The quality of screening procedures can be evaluated based on their effectiveness. Local strategies designed to eradicate CDH have been implemented, for instance in Rennes, France [2], and Coventry, UK [3], with remarkable effectiveness. Nevertheless, the results obtained by following good clinical practice guidelines in individual institutions do not predict nationwide results [4].

We are aware of only two prospective randomised trials, both done in Norway. One of these trials, in which clinical screening was performed routinely, found no significant difference between routine ultrasound screening and ultrasound screening reserved for those patients with risk factors for CDH [5]. The other trial, which also involved routine clinical screening, compared routine, risk factor-based, and no ultrasound screening [6]. No significant differences were noted across these three strategies. Overall, these findings fail to support the usefulness of ultrasound screening performed routinely or in patients with risk factors. Thus, the physical examination seems to be the reference standard for the diagnosis of CDH, provided it is performed by an experienced evaluator. The best indication for ultrasonography may be inadequate quality of clinical screening [7], although this palliative strategy is open to criticism and less than ideal. Ultrasonography in patients with clinical hip instability decreased treatment requirements in a study by Elbourne et al. [8]. On the other hand, ultrasound screening was associated with increased use of treatments, numbers of physician visits, and serial ultrasonography in a study by Rosendahl et al. [6].

The cost of CDH screening and of treatments given based on screening results is extremely difficult to assess, given the considerable heterogeneity in screening and quantification methods [9]. In the study by Elbourne et al. [8], the cost of screening and treatment was similar between clinical and ultrasound screening, although work time missed by the parents and long-term outcomes were not assessed.

### 1.5. Conclusions

This case-series study uncovered inadequacies in clinical CDH screening, which were obvious when assessed quantitatively and probably also involved poor clinical screening quality, although this last point was not proven. Thus, a communication and educational campaign drawing attention to good clinical practice in the field of CDH screening is required.

The usefulness of routine ultrasound screening has not been established. Ultrasonography may be indicated in patients with risk factors, although studies are needed to assess this possibility. Conflicting data on costs and treatments have been reported. These persisting uncertainties support the conduct of a prospective randomized multi-centre trial. Furthermore, we believe a crucial point is the involvement in future studies of primary-care physicians, who are playing an increasing role in the follow-up of infants in the first year of life.

<sup>2</sup> Survey led with the pediatricians AFPA (French Association of Ambulatory Pediatrics) by D. Proslie, A. Bocquet, P. Pacrot-Deffrenne, F. Life Wise, R. Assathiany and N. Gelbert.

**Table 1**  
Comparison of screening modalities for congenital dislocation of the hip across three geographic regions of France.

Indicators	Île-de-France (%)	Rhône-Alpes-Auvergne (%)	PACA (%)
Respondents working in maternity wards	14.3	46.6	42.4
Routine monthly clinical hip examination	76.6	88.5	86.0
Routine US in patients without RFs	0	0	9.1
Routine US before 4 weeks of age in patients with RFs	60.0	4.3	42.1
Routine US between 4 and 8 weeks of age in patients with RFs	30.8	90.2	73.9
Pelvic radiograph at 4 months of age in patients without RFs	14.3	0	10.0
Pelvic radiograph at 4 months of age in patients with RFs	80.2	8.6	35.3
US technique known: Graf	29.2	58.1	45.8
US technique known: Tréguier-Couture	3.1	6.7	8.0
Capable of interpreting US findings	19.8	35.2	28.3
Referral to orthopaedic surgeon if abduction limitation in the maternity ward	63.3	72.0	63.4
Immediate US if abduction limitation in the maternity ward	35.7	59.5	70.8

US: ultrasonography; RF: risk factor; PACA: Provence Alpes Côte d'Azur.

## 2. Screening for congenital dislocation of the hip<sup>3</sup>

### 2.1. Introduction

We conducted a postal survey of practices regarding congenital dislocation of the hip (CDH) screening among French community-based paediatricians belonging to the AFPA. The survey evaluated 45 questions covering 16 items and was conducted between 1 April and 1 May 2012 using SurveyMonkey software.

Data were available from 575 respondents, including 21 (3.7%) who performed hip ultrasonography themselves and 205 (36%) who worked in maternity wards. Only these 205 paediatricians responded to the first section of the questionnaire, which evaluated screening in maternity wards.

### 2.2. Results

#### 2.2.1. In maternity wards

**2.2.1.1. Influence of the presence of a risk factor.** In the absence of risk factors, 97% of respondents performed clinical screening once a month. However, 2.7% prescribed ultrasonography at 1 month of age and 5.9% only in girls; 8.7% obtained a radiograph at 4 months of age. For patients with risk factors, 97% of respondents performed monthly clinical screening, 34.7% prescribed routine ultrasound screening before 4 weeks of age, 71.1% prescribed routine ultrasound screening between 4 and 8 weeks of age, and 23.4% obtained a radiograph.

#### 2.2.1.2. Patients with abnormal findings by clinical screening.

**2.2.1.2.1. Dislocatable hip.** Ultrasonography was prescribed immediately by 75.6% of respondents and at 1 month of age by 64.8% of respondents. In addition, 75.6% of respondents obtained advice from an orthopaedic surgeon (suggesting that ultrasonography was obtained after double or triple diaper use to abduct the hips at 1 month by 24.4% of respondents).

**2.2.1.2.2. Dislocated hip.** Ultrasonography was obtained immediately by 82.1% of respondents and advice from an orthopaedic surgeon by 92.1% of respondents.

**2.2.1.2.3. Limited hip abduction.** Ultrasonography was prescribed immediately by 57.8% of respondents and at 1 month of age by 72.9% of respondents. Furthermore, 22.4% of respondents recommended double or triple diapering to abduct the hips and 63% obtained treatment guidance from an orthopaedic surgeon.

#### 2.2.2. In infants older than 1 month of age

Clinical examination of the hips was performed routinely at each visit by 85.3% of respondents. The clinical findings that prompted the prescription of ultrasonography were a palpable clunk (98.9%) and abduction limitation (97.7%). Of the ultrasonography reports, 32.2% failed to provide an opinion. The ultrasonography technique

was the Graf method combined with dynamic evaluation in 40.4% of cases and the dynamic single-slice Couture-Tréguier method in 14.4% of cases; in the other cases, no information on the technique was provided. Among respondents, 56.5% were unaware of sonogram interpretability criteria and 71.6% were unable to determine whether the findings were normal or abnormal.

A radiograph was obtained routinely by 8.8% of respondents and only in patients with risk factors by 39% of respondents. Radiography was the reference-standard investigation in patients with clinical abnormalities detected after 4 months of age.

#### 2.2.3. Differences across geographic regions

Three regions had high numbers of respondents: Île-de-France ( $n = 112$ ), Rhône-Alpes-Auvergne ( $n = 88$ ), and Provence Alpes Côte d'Azur or PACA ( $n = 57$ ). We used several indicators to compare these three regions (Table 1).

Ultrasonography was prescribed more often by PACA respondents, even in patients without risk factors. In patients with risk factors, Île-de-France respondents obtained ultrasonography earlier than recommended. Rhône-Alpes-Auvergne respondents complied more closely with recommendations. The Graf method was more widely used than the Couture-Tréguier method. Considerable differences in radiograph prescription were noted across regions.

### 2.3. Discussion

The vast majority of French paediatricians perform a clinical hip examination every month in patients with or without risk factors. Nevertheless, our survey showed inadequate attention to a major clinical finding, namely, hip abduction limitation with or without side-to-side asymmetry. Abduction limitation is the leading warning sign of CDH (97.7%), together with abnormal findings during dislocating manoeuvres (98.9%). Hip abduction must be assessed not only in the maternity ward, as a complement to the classic Barlow and Ortolani manoeuvres; but also throughout the first year of life, as after 1 month of age abduction limitation becomes the main clinical sign of CDH. Paediatricians are not sufficiently aware of the importance of hip abduction limitation, which may indicate either congenital pelvic obliquity or dislocation of the hip. When irreducible, hip dislocation contra-indicates double or triple diapering and requires prompt referral to an orthopaedic surgeon. In patients with abnormal findings from the clinical hip examination at the maternity ward, the low rate of immediate ultrasonography prescription, particularly in the Île-de-France region, is an unexpected finding from our survey.

Immediate ultrasonography can differentiate congenital pelvic obliquity from irreducible CDH yet was prescribed in this situation by only 57.8% of respondents. In patients with abnormal clinical findings, ultrasonography was obtained too late. Similarly,

**Table 2**  
Practices of paediatricians according to the results of the clinical hip examination.

Question	Options	North (%)	West (%)	AFFA (nationwide) (%)
RF=0	US	1	33 <sup>a</sup>	2.7
RF+	Radiograph at 4 months	22	8	23
Dislocatable	Immediate US	43	85	75
US at 1 month	Postural foot abnormalities	26	5	45
Radiograph at 4 months	RF	38	15	39

RF: risk factors; US: ultrasonography.

<sup>a</sup> Explained by the routine use of ultrasonography in girls in Rennes and the surrounding region.

inappropriate delays occurred in obtaining the advice of an orthopaedic surgeon, with no significant difference across the three regions.

Ultrasonography is rarely prescribed routinely. Instead, ultrasonography is usually obtained between 4 and 8 weeks of age in infants with risk factors. A minority of respondents routinely prescribed ultrasonography in girls.

After 1 month of age, most respondents performed a clinical hip examination once a month. This finding is at variance with an earlier study by the SoFOP of CDH diagnosed after 1 year of age, in which no clinical hip examination was performed in 20% of patients during the first 3 months and in 64% after 3 months [1].

#### 2.4. Conclusion

Our survey uncovered gaps in knowledge of ultrasonography techniques among paediatricians, particularly regarding image-quality criteria and image interpretation. Our data suggest that, in regions where paediatricians spend a larger proportion of their time working in maternity wards, knowledge of ultrasonography techniques and interpretation is better, albeit still insufficient (with the highest proportion being 35%, in the Rhône-Alpes-Auvergne region). This inadequate knowledge of ultrasonography may explain the continued reliance on radiography, which was performed in 39% of patients with risk factors. Radiography remained the reference standard in the Ile-de-France region, with prescription by 80.2% of respondents in patients with risk factors, compared to only 8.9% of respondents in the Rhône-Alpes-Auvergne region. These data suggest that poor knowledge of ultrasonography is associated with continued reliance on radiography.

### 3. Potential causes of variability in CDH screening results across geographic regions?<sup>4</sup>

#### 3.1. Introduction

A prospective study of congenital dislocation of the hip (CDH) diagnosed after 1 year of age [1] showed differences across regions, with western France (Bretagne and Pays de Loire region) having the highest rates of CDH detection and the North-Pas de Calais region the lowest rates (4-fold increase in cases diagnosed after 1 year of age). These data prompted us to compare the practices of paediatricians involved in CDH screening [1].

#### 3.2. Method

We used the questions in the nationwide survey conducted in April 2012 by the AFFA. Each of us contacted the paediatricians he or she knew to be involved in CDH screening. For each question, the responses by paediatricians in Western and Northern France were

compared, using the numbers recorded by the AFFA nationwide as the reference.

#### 3.3. Results

Table 2 lists the results. The response rate was 60%, with 326 respondents. All paediatricians working in maternity wards responded. Significant differences were found for only 5 of the 21 questions:

- course of action in patients with normal clinical findings and no risk factors (RF=0);
- course of action in patients with normal clinical findings and risk factors (RF+);
- course of action in patients with a dislocatable hip;
- reasons warranting ultrasonography at 1 month of age; and
- reasons warranting a pelvic radiograph at 4 months of age.

#### 3.4. Discussion

In the vast majority of cases, the responses supplied by paediatricians in Northern and Western France indicated good compliance with recommendations [10]. The more widespread use of ultrasonography in western France, which probably resulted in decreased prescription of a pelvic radiograph at 4 months of age, suggests a need for a randomised multi-centre nationwide study to evaluate the generalised use of hip ultrasonography at 1 month of age.

### 4. CDH screening modalities in France: survey among radiologists<sup>5,6</sup>

#### 4.1. Introduction

Since the 1991 consensus conference, the role for ultrasonography in screening for congenital dislocation of the hip (CDH) has been well established. The earliest technique used in France was described by R. Graf in 1980 [11] and involves an assessment of acetabular morphology on a lateral longitudinal view through the ilium, bony acetabular roof, Y cartilage, and ischium (Fig. 2). Starting in 2006, another technique involving scanning with the hip in the dislocating position, i.e., with flexed and adducted, was disseminated in the radiological community. A lateral longitudinal view is obtained in a slightly different plane that is more oblique anteriorly and passes through the pubic ossification centre (Fig. 3). This technique measures bony acetabular depth and differs markedly from the method described by R. Graf, as it involves measurement of the distance between the pubic ossification centre and femoral head. Abnormalities in acetabular shape related to CDH are not taken into account. Instead, this technique assesses the cause of these shape alterations, namely, femoral head position. This technique

<sup>5</sup> by Laurence Mainard-Simard and Hubert Ducou Le Pointe.

<sup>6</sup> We thank the French Society for Radiology (*Société Française de Radiologie*, SFR), Professor Jean-Pierre PRUVO, and Mr Julien SIMONNET for their help.

<sup>4</sup> Survey among paediatricians in Northern and Western France by Christian Morin, Madeleine Chapuis, Damien Fron and Sophie Guillard.

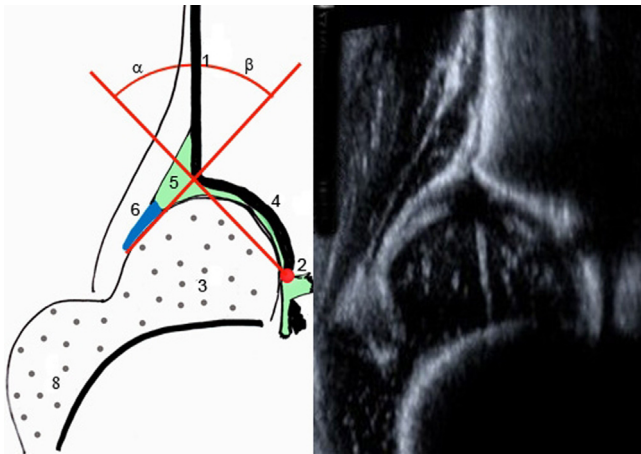


Fig. 2. Longitudinal lateral morphological view: technique described by Graf.

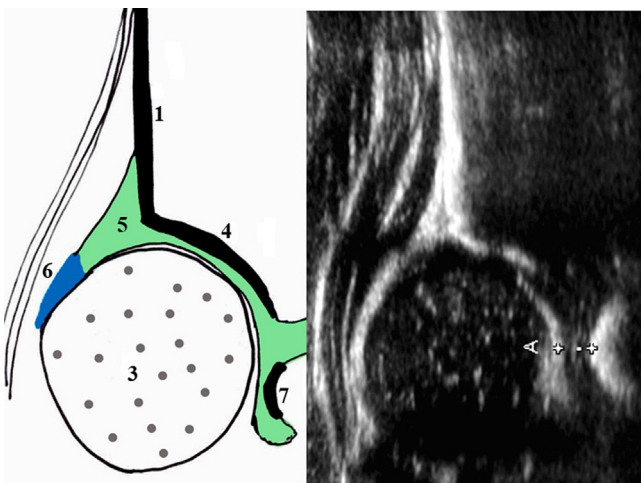


Fig. 3. Longitudinal lateral dynamic view: technique described by Couture-Tréguier. 1. Bony iliac wing. 2. Inferior tip of the ilium. 3. Cartilaginous femoral head. 4. Roof of the bony acetabulum. 5. Cartilaginous acetabulum. 6. Labrum. 7. Pubis. 8. Cartilaginous trochanter

was described by the French radiologist Alain Couture [12] and was subsequently refined and tested routinely on all babies born in the Ille-et-Vilaine region of France by Catherine Tréguier [2]. It has been proven reliable and reproducible when performed after receiving basic training.

#### 4.2. Method

The first part of the survey focussed on the use of ultrasonography as a screening tool for CDH. The objective was to identify radiologists involved in CDH screening, determine their level of training, identify training needs, and determine the method used. In the second part of the survey, the radiologists gave their opinion about possible routine use of ultrasound screening in all infants. Finally, the third section of the survey was designed to determine why pelvic radiography remains widely used. A 2012 IRSN report showed that one out of every four infants had a pelvic radiograph performed before 1 year of age. Although the report does not specify the reasons for pelvic radiography, at this age CDH screening is by far the most common indication. The survey was conducted in May 2013 among the 5393 members of the French Society for Radiology (*Société Française de Radiologie*) practicing in continental and overseas regions of France.

#### 4.3. Results

We collected survey questionnaires completed by 828 radiologists throughout France. Among these 828 respondents, 669 reported using ultrasonography to screen for CDH. Overall, 55.1% of respondents described themselves as generalist radiologists having a minority of paediatric patients, 37.3% as regularly providing care to paediatric patients, and only 7.6% as providing care only to paediatric patients. This distribution indicates that our sample is representative.

Among radiologists involved in CDH screening, one-third performed fewer than five hip ultrasonograms per month and 40.3% fewer than five per week. Thus, hip ultrasonography was a marginal activity for three-quarters of radiologists involved in CDH screening. Among these radiologists, 67.3% had received specific training. Among the remaining 32.7% of radiologists, 70.6% reported wanting to obtain specific training.

The technique used was acetabular depth measurement in 86.1% of cases and both methods concomitantly in 32.4% of cases. Only 13.9% of respondents used the Graf method alone. This result is relevant to the small number of hip ultrasound examinations performed by most of the radiologists each month, as acetabular depth measurement (Couture-Tréguier method) is simpler to perform: the only requirement is identification of the pubic ossification centre and femoral head to enable measurement of the distance between these two structures, with the thigh firmly held in flexion and adduction. For CDH screening, this technique is easier to perform correctly than the Graf method, which involves obtaining a highly specific sagittal lateral view and fulfilling extremely stringent quality criteria to enable accurate interpretation. Thus, the Graf method requires greater levels of training and practical experience.

The studies done by Catherine Tréguier and Madeleine Chapuis in the Ille-et-Vilaine region of France established that delays in diagnosing CDH can be eliminated by performing screening hip ultrasonography in all male and female infants with risk factors. Nevertheless, the 2011 SoFOP survey [1] showed that 71% of infants diagnosed with CDH after 1 year of age had no risk factors and that 17% were boys. Furthermore, some European countries such as Austria have generalised the use of screening ultrasonography to eliminate diagnostic delays. These data invite a discussion of the feasibility in France of routine screening ultrasonography performed as an adjunct to clinical screening. Among the surveyed radiologists, 76.6% were in favour of routine screening ultrasonography but 51.6% believed this strategy was not feasible, chiefly because of the insufficient number of sonographers and lack of training. Thus, 75% of respondents supported the institution of validated formal training should routine ultrasonography be recommended in all infants.

The last section of the survey focussed on the indications for pelvic radiography at 4 months of age. Among respondents, 70.4% reported that referring physicians continued to prescribe a routine pelvic radiograph at 4 months of age in all infants with risk factors, in contradiction with the recommendations developed at the 1991 consensus conference. This fact explains the inappropriately large number of pelvic radiographs performed in France in infants younger than 1 year of age. Variations across geographic regions are probably marked, but we were unable to obtain data on this point.

#### 4.4. Discussion

A well-conducted clinical hip examination coupled with high-quality ultrasonography performed using either of the available techniques is the key to minimising not only diagnostic delays, but also unnecessary treatments. As stated previously at the 1991

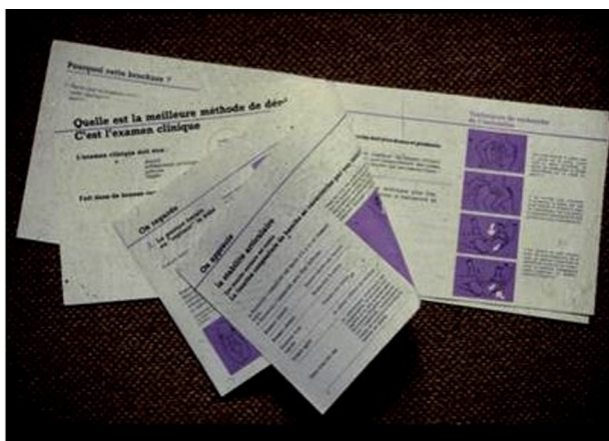


Fig. 4. CFES fact sheet issued in 1985.

consensus conference, a pelvic radiograph at 4 months of age is not a screening method but a rescue diagnostic method in infants found to have clinical abnormalities after 3 months of age, whether or not ultrasonography was performed previously.

The vast majority of radiologists are willing to perform hip ultrasonography to the extent that this investigation benefits CDH screening. They support the development of validated formal training, which could be incorporated into a nationwide continued medical education programme.

## 5. Recommendations issued by the French National Authority for Health (*Haute Autorité de Santé [HAS]*)<sup>7</sup>

“It’s all been said before, but since nobody listens, it must be said over and over again.”

Paul Valéry

In October 2013, the French National Authority for Health (*Haute Autorité de Santé [HAS]*) posted its recommendations about screening for congenital dislocation of the hip (CDH) on its website. These recommendations were developed by a panel of clinicians and HAS experts. A review of conceptual changes over time and of the current situation is warranted to shed light on the public health issues raised by CDH screening; we also offer a few suggestions designed to ensure that these recommendations are effective.

### 5.1. 1985–2014: 30 years of screening!

Screening for CDH has generated unceasing debate over the last three decades. Between the late 1970s and early 1980s, reports that many cases of CDH were still diagnosed only at walking acquisition prompted a variety of research programmes, which produced new insights. Thus, studies have established that CDH develops prenatally, clarified the pathogenesis of CDH, and highlighted the importance of an early neonatal diagnosis based in large part on a well-conducted routine clinical examination of the hips. These anatomic and pathogenic studies have contributed to improve the prognosis of CDH.

Based on these data, a task force (including two of us, RS and RK) developed a fact sheet in 1985 [13] under the aegis of the French Ministry of Health (Fig. 4). This fact sheet was then widely disseminated. During this period, ultrasonography of the hip, introduced by the Austrian R Graf, gained considerable popularity, nearly to the point of being viewed as a substitute for the clinical hip

examination. A 1991 consensus conference [10] then clarified the indications of ultrasonography as an adjunctive screening method instead of a tool to be used alone.

Despite these recommendations, practices continued to vary widely across groups and geographic regions, particularly regarding the indications of ultrasonography and the definition of ‘risk factors’. A nationwide prospective study conducted by the SoFOP in 2010–2011 confirmed that CDH screening had become less effective [1]. Likely contributors to the increased number of late diagnoses probably included [14]:

- excessive haste or suboptimal conditions when conducting the clinical hip examination, or failure to repeat this examination at each visit during the first year of life;
- inadequate awareness of risk factors; and
- radiography or ultrasonography performed without a prior clinical examination, leading to inappropriate and/or poorly controlled treatments.

A few recent studies have clarified a number of controversial issues regarding the terminology [15], ultrasonography [16], and clinical signs [17] of CDH. However, the absence of clear directives prompted the SoFOP to continue its campaign, in collaboration with a number of partners. This work culminated in a symposium held in late 2013 (the topic of this article) and, more importantly, in the development of recommendations (French Ministry of Health in February 2013; then HAS in November 2013).

However, there is some evidence [18] that a few cases of subluxation of the hip may develop slowly after birth and may therefore be undetectable in the neonatal period. Consequently, repeating the clinical examination regularly until the child learns to walk is crucially important.

### 5.2. A collaborative process

The work conducted under the aegis of the HAS starting in 2012 relied on the recommended methodology for this type of study designed to develop professional practice guidelines:

- Defining the objective: does optimal neonatal CDH screening consist only in a clinical hip examination (and if so, using which manoeuvre), only ultrasonography (using which technique), or both (according to a decision-tree strategy)?
- Establishing a task force including all types of professionals involved in CDH screening via their professional organisations, to ensure that the problem is analysed comprehensively and, above all, to ensure good compliance with the recommendations once they are published. Thus, the task force consisted of:
  - paediatricians (AFPA-SFP),
  - orthopaedic surgeons (SOFOP and SOFCOT),
  - radiologists (SFIPP and SFR),
  - members of the Primary-Care Physician Organisation (*Collège de la Médecine Générale*), since these professionals are increasingly providing follow-up to infants during their first year.
- Describing the current situation in France, particularly the screening modalities, with their variations across geographic regions and a comparison of their results.
- Identifying and analysing relevant articles in the medical literature.
- Developing recommendations: this task was undertaken by the HAS (Fig. 5).

Similar work was conducted in the US in 2006 [9] and by the European Federation of National Associations of Orthopaedics and

<sup>7</sup> By R. Kohler, P. Wicart, C. Morin and R. Seringe

## Fiche mémo

# Luxation congénitale de la hanche : dépistage

Octobre 2013

### Objectif

L'objectif de ce travail est d'aider les médecins généralistes, pédiatres, pédiatres néonatalogistes, médecins de protection maternelle et infantile, chirurgiens orthopédistes, radiologues, gynéco-obstétriciens, sages-femmes, puéricultrices, masseurs-kinésithérapeutes et ostéopathes à dépister précocement la luxation congénitale de la hanche (LCH), afin d'instaurer une prise en charge thérapeutique beaucoup plus simple pour l'enfant.

### Préambule

- La LCH est une anomalie du développement de la hanche qui se manifeste par une **instabilité** de la hanche, c'est-à-dire une mobilité anormale entre le bassin et le fémur. La tête fémorale sort, ou peut sortir, en partie ou en totalité de la cavité acétabulaire, alors qu'une hanche normale est stable.
- La LCH peut se présenter sous plusieurs variantes, de la forme franche à la plus discrète : hanche luxée, hanche luxable, subluxation. Les hanches luxées sont environ quatre fois moins fréquentes que les hanches luxables.
- Après l'accouchement, la levée des contraintes obstétricales permet la plupart du temps spontanément un remodelage, une stabilisation et la guérison. Cependant, les LCH non corrigées entraînent une boiterie dès le début de la marche, une douleur chronique et une atteinte dégénérative précoce.
- Le traitement de la LCH est d'autant plus simple et efficace que le diagnostic est précoce.
- En France, l'incidence de la LCH est estimée à 6 pour 1 000 naissances, avec une forte prédominance féminine, et l'incidence des LCH de diagnostic tardif (après l'âge de 1 an) était de 8,4 pour 100 000 en 2010.

### Messages clés

- Il y a un bénéfice à faire le diagnostic de LCH le plus tôt possible, de préférence avant la fin du premier mois, sinon avant 3 mois. En effet, le traitement est alors plus efficace, moins lourd et moins coûteux.
  - Le diagnostic de LCH repose en premier lieu sur l'examen clinique, primordial et obligatoire, qui doit être répété lors de chaque examen systématique du nouveau-né et du nourrisson jusqu'à l'acquisition de la marche. En cas d'examen clinique anormal (limitation d'abduction, instabilité), une échographie est à réaliser rapidement.
  - Les examens complémentaires à pratiquer dans le cadre du dépistage :
    - la radiographie n'a plus sa place dans le dépistage de la LCH jusqu'à 3 mois ;
    - l'échographie en coupe coronale externe avec mesure du fond cotyloïdien est indiquée dans les cas suivants :
      - existence de signes cliniques (échographie à réaliser rapidement) ;
      - facteurs de risque, en particulier :
        - » présentation par le siège,
        - » antécédents familiaux du premier degré,
        - » diverses anomalies orthopédiques, notamment éléments du syndrome postural.
- Cette échographie doit être effectuée à l'âge de 1 mois.

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Fig. 5. HAS recommendations (2014).

Traumatology (EFFORT) in 2011 but reflects very different national and cultural approaches.

### 5.3. Recommendations issued by the HAS

CDH screening should rely on clinical hip examinations, with added ultrasonography as an option.

A clinical hip examination should be performed routinely under good conditions at each mandatory visit, i.e., in the maternity ward; at 2 weeks of age; and at 1, 2, 4, 6, 9, and 12 months of age:

- patients with abnormal findings from the clinical hip examination (abnormal abduction or instability with a clunk or piston motion) should be referred to a specialist and may undergo ultrasonography of the hip if needed;
- in patients with normal clinical findings:
  - if a risk factor is present (CDH in a first-degree relative, breech presentation, or postural syndrome), selective ultrasonography should be performed between 4 and 6 weeks of age,
  - in the absence of risk factors, a clinical hip examination should be performed repeatedly until the child learns how to walk.

A number of points that require further study and validation might lead to changes in these conclusions. These points include:

- improvements in clinical screening practices (awareness that abduction limitation is a simple and reliable warning sign);
- involvement of primary-care physicians in CDH screening efforts;
- definition of risk factors for CDH (e.g., are postural foot abnormalities and/or female gender associated with CDH?);
- determination of the usefulness of routine ultrasonography, of which no proof exists to date;
- the conduct of case-control studies.

#### 5.4. Conclusions

Obtaining compliance with these recommendations is of the utmost importance to ensure improvements in CDH screening and, most importantly, greater uniformity in CDH screening practices. The goal of the recommendations is to eliminate the still too common diagnostic delays with the resulting need for burdensome treatment protocols.

These recommendations must be disseminated broadly, via professional organisations including specialist organisations. Useful dissemination methods include presentation of the recommendations at widely attended conferences and the availability of fact sheets on websites of professional organisations (for paediatricians, radiologists, and orthopaedic surgeons). Given that CDH is a French public health issue, the recommendations must be widely published and discussed in French journals, as illustrated by the present article.

Major training efforts are needed, of the type provided in the 1980s. Thus, Baby Hippy hip simulator models (Laerdal Medical, Limonest, France) (Fig. 6) should be available in hospital departments involved in CDH screening to be used for the practical training of the professionals who will be in charge of CDH screening (residents, paediatricians, primary-care physicians, and midwives). Mentoring is indispensable: each individual who has received training in CDH screening must then teach the screening method to others.

Full advantage should be taken of the recent surge of interest in continued medical education (CME). Thus, the CME programmes that are developed and validated each year should include material on CDH screening. Contemporary audio-visual methods are particularly well suited to training in CDH screening, and e-learning methods allow the training of a vast number of professionals.



Fig. 6. Baby Hippy hip simulator model.

Examen clinique			
Fréquence cardiaque au repos		Fémorales perçues	non <input type="checkbox"/> oui <input type="checkbox"/>
Fréquence respiratoire au repos		Vigilance normale	non <input type="checkbox"/> oui <input type="checkbox"/>
Souffle cardiaque	non <input type="checkbox"/> oui <input type="checkbox"/>	Réaction aux stimuli sonores	non <input type="checkbox"/> oui <input type="checkbox"/>
Hépatomégalie	non <input type="checkbox"/> oui <input type="checkbox"/>	Tonus axial normal	non <input type="checkbox"/> oui <input type="checkbox"/>
Spénomégalie	non <input type="checkbox"/> oui <input type="checkbox"/>	Tonus des membres normal	non <input type="checkbox"/> oui <input type="checkbox"/>
Hernie inguinale	non <input type="checkbox"/> oui <input type="checkbox"/>	Mobilité normale	non <input type="checkbox"/> oui <input type="checkbox"/>
Ictère	non <input type="checkbox"/> oui <input type="checkbox"/>	Fosses lombaires libres	non <input type="checkbox"/> oui <input type="checkbox"/>
Si oui, taux maximum à J (...) de bilirubine :		Hanche droite normale	non <input type="checkbox"/> oui <input type="checkbox"/>
Organes génitaux :		Hanche gauche normale	non <input type="checkbox"/> oui <input type="checkbox"/>
		Pied droit normal	non <input type="checkbox"/> oui <input type="checkbox"/>
		Pied gauche normal	non <input type="checkbox"/> oui <input type="checkbox"/>
Autres anomalies :			
Examen ophtalmologique			
Cilés oculaires de taille normale		non <input type="checkbox"/> oui <input type="checkbox"/>	
Cornées transparentes		non <input type="checkbox"/> oui <input type="checkbox"/>	
Dépistage d'une déficience auditive			
		non <input type="checkbox"/> oui <input type="checkbox"/>	
		Méthode :	

Fig. 7. Child Health Record: section on the neonatal clinical examination (Perinatal period: Clinical examination; Ophthalmological assessment; Screening for hearing impairment).

Prospective randomised multi-centre epidemiological studies are needed, because dislocation does not develop in all high-risk hips and, on the opposite, hip dislocation may occur in the absence of risk factors. Registries should be created to identify all cases of CDH and to look for correlations between CDH and a variety of factors. In addition, prospective studies should compare screening according to the recommended modalities (routine clinical examination and selective ultrasonography) to screening with routine clinical examination and ultrasonography in both male and female infants.

Finally, improvements in the Child Health Record would be welcome. The latest version (December 2005) provides little room for detailing the neonatal examination, most notably the clinical hip examination, for which the only response options are 'normal hip' and 'abnormal hip' (Fig. 7). A brief reminder of CDH screening modalities (as provided for other items in the Child Health Record) would emphasise the importance of simple clinical manoeuvres (particularly an assessment of the abduction range) and define the risk factors for CDH. This information would encourage physicians to perform a comprehensive and more systematic examination and, most importantly, to repeat this examination during subsequent visits.

#### Disclosure of interest

The authors have not supplied their declaration of conflict of interest.

#### References

- [1] Morin C, Wicart P, SoFOP. Congenital dislocation of the hip, with late diagnosis after 1 year of age: update and management. *Orthop Traumatol Surg Res* 2012;98(6 Suppl.):S154–8.
- [2] Tréguier C, Chapuis M, Branger B, Bruneau B, Grellier A, Chouklati K, Proisy M, Darnault P, Violas P, Pladys P, Gandon Y. Pubo-femoral distance: an easy sonographic screening test to avoid late diagnosis of developmental dysplasia of the hip. *Eur Radiol* 2013;23:836–44.
- [3] Marks DS, Clegg J, Al-Chalabi AN. Routine ultrasound screening for neonatal hip instability: can it abolish late-presenting congenital dislocation of the hip? *J Bone Joint Surg Br* 1994;76B:534–8.
- [4] Eastwood DM. Neonatal hip screening. *Lancet* 2003;361:595–7.
- [5] Holen KJ, Tegnander A, Bredland T, Johansen OJ, Saether OD, Eik-Nes SH, Terjesen T. Universal or selective screening of the neonatal hip using ultrasound? A prospective randomised trial of 15 529 newborns. *J Bone Joint Surg Br* 2002;84-B:886–90.
- [6] Rosendahl K, Markestad T, Lie RT. Ultrasound screening for developmental dysplasia of the hip in the neonate: the effect on treatment rate and prevalence of late cases. *Pediatrics* 1994;94:47–52.
- [7] Holen KJ, Terjesen T, Tegnander A, Bredland T, Saether OD, Eik-Nes SH. Ultrasound screening for hip dysplasia in newborns. *J Pediatr Orthop* 1994;14:667–73.



- [8] Elbourne D, Dezateux C, Arthur R, Clarke NM, Gray A, King A, Quinn A, Gardner F, Russell G, UK Collaborative Hip Trial Group. Ultrasonography in the diagnosis and management of developmental hip dysplasia (UK Hip Trial): clinical and economic results of a multicentre randomised controlled trial. *Lancet* 2002;360:2009–17.
- [9] Shipman SA, Helfand M, Nygren P, Bougatsos C. Screening for developmental dysplasia of the hip: systematic evidence synthesis. Evidence Synthesis No. 42 Agency for Healthcare Research and Quality; 2006. Available at: [www.ahrq.gov/clinic/uspstfix.htm](http://www.ahrq.gov/clinic/uspstfix.htm)
- [10] Conférence de consensus sur le dépistage de la luxation congénitale de la hanche. *Arch Fr Pédiatr* 1992;49:145–7.
- [11] Graf R. The diagnosis of congenital hip-joint dislocation by the ultrasonic Combound treatment. *Arch Orthop Trauma Surg* 1980;97:117–33.
- [12] Couture A, Baud C, Prodhomme O, Sguintaah M, Veyrac C. Ultrasound of the neonatal hip: initial evaluation and follow-up. *J Radiol* 2011;92:142–65.
- [13] [brochure] Luxation congénitale de hanche. Paris: CFES–Direction Générale de la Santé; 1985.
- [14] Kohler R. Les enjeux du dépistage de la luxation congénitale de hanche. *Arch Pédiatr* 2011;18:935–8.
- [15] Kohler R, Seringe R. La luxation congénitale de hanche : les faits, les signes, les mots; état de l'art. *Rev Chir Orthop* 2008;94:217–27.
- [16] Couture A, Baud C, Prodhomme O, Saguintaah M, Veyrac C. Échographie de la hanche néonatale : bilan initial et suivi thérapeutique. *J Radiol* 2011;92:112–65.
- [17] Guillard-Charles S. Diagnostic et traitement de la luxation congénitale de hanche avant la marche. Conférence d'Enseignement de la SOFCOT. Paris: Elsevier; 2011. p. 197–219.
- [18] Raimann A, Baar A, Raimann R, Morcuende J. Late developmental dislocation of the hip after initial normal evaluation. A report of five cases. *J Pediatr Orthop* 2007;27:32–6.