

# Congenital dislocation of the hip. Preventive Policies in Different Parts of the World. Review of the Literature and Personal Experience

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Different programs for detecting and preventing developmental dysplasia of the hip (DDH). By analyzing the literature on may conclude that early detection of DDH should involve information from all branches of the health-care system.

Prevention is more effective when based upon a conscientious, methodical and periodical clinical examination performed in the maternity ward. When the results of the said examination are suspect, abnormal or ambiguous, or when there are obvious risk factors, an ultrasound becomes necessary.

It should be remembered that the majority of dislocated hips do not present with risk factors.

## Luxación congénita de cadera. Políticas de prevención en el mundo. Revisión de la bibliografía y experiencia personal

Se analizan los diferentes programas de detección y prevención de la luxación congénita de cadera (LCC). Revisando la bibliografía puede concluirse que en la detección precoz de la LCC deben involucrarse todos los estamentos sanitarios para dar información.

La prevención es más efectiva cuando se apoya en una exploración clínica bien hecha, metódica y periódica en las maternidades. Por eso, cuando los resultados del examen clínico sean sospechosos, anormales o ambiguos, o haya factores de riesgo evidentes, la ecografía será necesaria.

Conviene recordar que la mayoría de las caderas luxadas no presentan factores de riesgo.

**Key words:** *DDH, prevention, early detection, ultrasound.*

**Palabras clave:** *LCC, prevención, detección, ecografía.*

During the last 50 years, congenital hip dislocation (CHD) has undergone many changes both in terms of the approach and therapeutic strategies used. Contributing factors have been: pelvic osteotomies<sup>1-4</sup>, the Pavlik harness<sup>5,6</sup>, imaging techniques (ultrasound, magnetic resonance, computerized axial tomography [CAT]) and a better understanding of post-reduction necrosis.

Some dogmas have currently been set aside, others remain in place. Among the advances made, it can be said

that a basic principle has been established, i.e. prevention, as well as a strategy, i.e. early reduction of the dislocated hip, and an aim, i.e. the need to obtain acetabulo-femoral concentricity to prevent arthritis.

Something we must never cease to repeat is that the need for CHD prevention must be a priority in all pediatric orthopedic services. All newborns must have their hips examined and assessed at the moment of birth and regularly during the first year of life.

Early detection is, however, beset by difficulties, since clinical examination is not easy<sup>7</sup>. Of every 1,000 births, CDH<sup>7,8</sup> is only seen in 10 or 12. Therefore, prevention policies vary considerably between different countries. In Sweden, prevention is well established. Every newborn is carefully supervised by an orthopedic service that becomes an effective regional vantage point.

In Serbia, Klisic<sup>10</sup>, after a prevention campaign, proposed a systematic abduction bandage for all newborns that

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decreased prevalence in 50%. In the United States, clinical examination of newborns is recommended, although there are many different opinions on this. Morrissy<sup>11</sup> expressed his doubts as to the validity of a systematic detection protocol due to the risk of false positives and an excess of harmful treatment.

In Austria ultrasound at birth has found support, whereas Wientroub and Grill<sup>12</sup>, in an excellent review, question its validity. They indicate that ultrasound must only be used in cases of hips that are clinically abnormal or those that present risk factors.

## PREVENTION IN THE LANGUEDOC-ROUSSILLON REGION

Languedoc-Roussillon is a region in the southeast of France with a population of 2 million and an annual birthrate of 25,000 in 27 maternities where 207 pediatricians, 142 obstetricians and 4,160 family physicians work. The hospital center of reference is the *Centre Hospitalier Universitaire*, in Montpellier, which receives all the complex cases of hips that require treatment. The policy applied is essentially based on information, communication and education of all members of the health network.

By means of this program, 1,056 newborns with CHD were treated from 1982 until 2002. The large majority were girls, with a 5.8:1 ratio. The left hip was more frequently dislocated than the right one (1.8:1), although bilateral dislocations were 41.2%. The series was formed by 28% dysplastic hips, 26.5% hips with subluxation, 46.5% hips with reducible dislocations and 1.3% non-reducible dislocated hips. Risk factors were divided into major (family history, breech-birth, postural syndrome) and minor (primiparous birth and weight at birth greater than 4 kg).

Direct history (parents and grandparents) was seen in 31% of cases. The rates remained stable over the years, with small fluctuations, but were always above 20%.

Breech-births were seen in 25% of cases, in comparison with 3% in the general population. The percentage of cesareans was 23%, in comparison with 14% in the general population; it must be remembered that 58% of cesareans of newly born with CHD are carried out in breech presentation. We did not consider twin births as a risk factor for CHD, even though these were 0.5% in comparison with 2.7% in the general population.

Postural syndromes associated with CHD were seen in 11.8% of cases<sup>13,14</sup>. The most frequent were foot anomalies, talipes (35%), metatarsal adduction (18%), club foot (5%), congenital torticollis (32%) and plagiocephaly (5%).

The rate of primiparous mothers was 52.3% in comparison with 41% of the general population and newborns with a weight above 4 kg at birth were 9.2% of cases, in comparison with 6.4% of the population.

The frequency of the different risk factors was assessed in the series studied. There was 18% of newborns with no risk factor, either major or minor, there was 64% of newborns with major risk factors. We found 53% with only 1 major risk factor, 9% with 2 major risk factors and 2% with 3 major risk factors. On the other hand 62% of newborns had minor risk factors; only 1 minor risk factor 58% and 2 minor risk factors 4%. The number of newborn with a major or minor associated risk factor was 38%.

The mean age of the children at the moment of diagnosis was 10 weeks in the complete series, with a decrease in mean age with time. In 1983, 33% of cases diagnosed were less than 1 month old, whereas in 2002 these were 70%. In 1983, 7% of the cases were detected after 1 year of age, whereas in 2002 this went down to 2%.

In 1983, pediatricians carried out 33% of the diagnoses and in 2002, 73%. In 1983, 22% of dislocations were detected in the fourth month, whereas in 2002, 9% were. In 1992 ultrasound images detected 67% of dislocations and in 2002, 84%.

The hospitalization rate has also decreased with the years. In 1983 it was 58%, 29% in 1992 and 3% in 2002. This coincides with the increase of ambulatory treatment, which was 42% in 1983 and 97% in 2002.

## CONGENITAL HIP DISLOCATIONS DIAGNOSED LATE

The detection of CHD is being achieved earlier and earlier, but some cases are diagnosed after 3 months of age. In actual fact, our study shows that in 126 patients, 117 girls and 9 boys, began treatment after 3 months of age. Of these 66% began between 3 and 6 months of age, 19% between 6 and 12 months of age and 15% when they were over 1 year old. This can be due to several factors. First and foremost is the fact that risk factors can be undervalued.

Since 28.5% had a history of CHD, 13.5% were breech births, 8% had a postural syndrome associated with CHD, 45% of the mothers were primiparous and 10% weighed over 4 kg. Girl breech births were 16% of the cases.

This shows the lack of information of the health staff. Furthermore, 63% of the babies did not have hip ultrasounds, in spite of the fact that at least a third of them had at least one risk factor. Although 10% of those that had ultrasounds that showed signs of abnormality did not receive treatment or received minimal treatment. Seven percent had normal ultrasounds, and 20% had ultrasounds at 4 months of age that showed CHD.

An analysis of the causes of delay in the diagnosis showed that there is a lack of communication between maternity pediatricians and family physicians that see children during their first year of life. The family physician thinks that if the hips were examined and were considered normal they are normal hips and forgets that during the first year of

life hips must be regularly examined. And it is important to remember that families move.

### CONGENITAL HIP DISLOCATION IN BULGARIA

There are about 70,000 births a year in Bulgaria. Darmanov and Zagora<sup>15</sup> recorded their experience in the Stara Zagora Maternity with 4,000 births a year. Hip examination, during the first year of life, is carried out by specialist orthopedic surgeons. A second exam is carried out during the 2<sup>nd</sup> and 3<sup>rd</sup> month of life.

In 5 years 20,147 newborns were entered into this protocol amongst which 124 babies with CHD were detected. Treatment was, initially, abduction with unstable hips, if this persisted at 4 weeks, a Van Rosen brace was used. Most dislocations, 119, were detected in the first week of life, and only 5 babies were diagnosed in the third month, by means of a second exam. Of these, 72% of the hips diagnosed during the first week had stabilized at 3 weeks, 6% were unstable after 1 month with a Van Rosen brace and 22% were treated with a Pavlik harness.

Six years later the 124 children that had entered the protocol were reviewed. Of these, 122 had normal hips and 2 presented anomalies, one had post-reduction osteochondritis and one severe anteversion of both hips.

A review of results showed how an appropriate organization and simple medical control, carried out by specialists from the moment of birth, achieved very good results with simple measures. It must be remembered that only 2 orthopedic surgeons can examine 4,000 newborns a year.

It is advisable to underline the need for a new exam, during the third month, which may be carried out by the pediatrician based on limitation of hip abduction.

### DETECTION PROTOCOL IN GERMANY

In 1990, Tonnis et al<sup>16</sup> considered that ultrasound was more effective than a clinical exam, if the imaging equipment was of good quality and the image reporter knew how to use the Graf<sup>17,18</sup> method.

Von Kries et al<sup>19</sup> assessed detection protocols of systematic diagnosis by means of ultrasound, and showed their difficulties, but if the ultrasound study was carried out by specialists this method was better than clinical examination. One case in 6,000 required surgery and 2/3 of the surgical cases were resolved with closed reduction, 11% with open reduction and 23% required a Salter or femoral osteotomy.

According to this team, ultrasound imaging reduces the number of surgical procedures in 75%, although they recognize that it is impossible to eliminate surgery and that systematized ultrasound imaging has a perverse effect, since the number of operated hips doubles, and that one of each

four newborn that underwent ultrasound imaging required a second exam.

This study must be compared with the study published by Wientroub and Grill<sup>12</sup> in Austria, who show less enthusiasm than Graf<sup>17</sup> and Tonnis et al<sup>16</sup>. A systematic CHD detection protocol requires equal equipment in all centers, that must be renewed constantly, homogeneous protocols and highly qualified staff, all of which makes application of this method difficult. Wientroub and Grill<sup>12</sup> conclude that the exam is frequently repetitive and treatment unnecessary.

### DETECTION PROTOCOL IN SWEDEN

Detection methods in Sweden continue to be a model and a reference<sup>20-22</sup>. There are 80,000 births per year in this country and an early detection program is in place in all maternities. Ultrasound is selective and is requested when the hips are unstable or there are risk factors. The Van Rosen brace is widely used. The rate of diagnosis is 12.7 per 1,000 births, although, after exam by a specialist, only one out of two unstable hips is treated (6.8/1,000). Ultrasound<sup>21,22</sup> is a supplement of clinical examination that improves the rate of detection of unstable hips, reducing the number of false Ortolani and Barlow tests. Ultrasound may replace X-rays in the follow-up of children with risk factors<sup>23</sup>. The Swedish policy of CHD detection is extremely effective and has been so for many years.

### SITUATION IN THE USA

The USA has a population of 250 million, with 4 million births a year, a large territory and many states that are larger than most European countries. This has led to a very special approach on the part of the American Academy of Pediatrics<sup>24</sup>, which establishes that all newborns be examined at birth by a specialist in orthopedics. Clinical examination must be repeated in the second week and then at months 2, 4, 6 and 9 and again when the child starts to walk.

Only when the exam is abnormal or there is some risk factor is an ultrasound ordered. When the Ortolani<sup>25</sup> or Barlow<sup>26</sup> tests are positive, the newborn must be referred to a specialist in orthopedics. If the clinical result is doubtful, or no clinical signs are found, a new exam at 2 weeks is recommended. Systematic treatment in abduction for all children is not recommended.

Risk factors must be assessed based on sex, since the risk for girls is 19/1,000 births and for boys 4/1,000. Furthermore, the risk for girls with familial history is 44/1,000 births whereas for boys it is 9.4/1,000. The percentage in breech births is also different, 120/1,000 in girls and 26/1,000 in boys. Due to this, ultrasound imaging is recom-

mended in girls with a family history or when they are a breech birth.

### CHD DETECTION PROTOCOL IN CANADA

Canada is another huge country, 19 times the size of France, but with a population of only 30 million and a population density of 3/km<sup>2</sup> and 350,000 births per year (half the amount of those in France).

In Vancouver, Tredwell and Bell<sup>27</sup> analyzed the effectiveness of early detection of CHD and cost advantages. Patel<sup>3</sup> concentrated his attention on the following: 1) Many treatments are not necessary, what is more they are harmful. 2) Systematic ultrasound is not recommendable, especially when 60% of newborns have one risk factor. 3) Ortolani<sup>25</sup> and Barlow<sup>26</sup> tests become less specific with age and become masked by abductor retraction. 4) The most effective prevention method is repeated clinical exams.

### PREVENTION IN NEW ZEALAND

New Zealand is a country with a population of 5 million of which 80% is urban, with approximately 50,000 births per year. Between 1995 and 2001 there were 15,397 births recorded in the Dunedin region in the south of the country<sup>28</sup>.

The detection program was based on a methodical clinical examination carried out by a specialized orthopedic surgeon. Ultrasound imaging was very selective and was only requested for cases of clinical instability, risk factors or clinical suspicion. Of the total number of 15,397 births assessed, ultrasound imaging was carried out on 733 newborns (4.8% of all those born), 593 due to risk factors, although they were normal on clinical examination and the rest (140 newborns) due to unstable hips (9/1,000 births). In 57 children with ambiguous clinical signs ultrasound follow-up was carried out until hip normalization.

A Pavlik harness was used to treat 83 children (5.4/1,000), although treatment failed in 8 cases (10%) that had to be treated with an abduction brace (5 cases). Two children required closed reduction and one open reduction.

In spite of the early detection program, 12 late cases appeared (0.65/1,000), 6 had been considered normal at birth and had no risk factors and 3 had been in the intensive care unit (ICU) and their hips had not been assessed. Another child, treated with a Pavlik harness until normal ultrasound imaging, had a new dislocation at 6 months of age. In total, 8 children required closed reduction, and 1 child open reduction; resulting in a rate of surgery of 0.58/1,000.

The study ends with emphasis on the following aspects: 1) Examination for CHD detection is necessary, it

must be carried out by a specialist in orthopedic surgery, this is better than examination by a pediatrician. 2) Ultrasound imaging must only be indicated if there are risk factors or when some anomaly is detected clinically. 3) It is advisable to supervise small instabilities by ultrasound imaging without applying any treatment. 4) One child of every 2 diagnosed requires treatment (approximately 5/1,000). 5) One child in every 2,000 births will require surgery. This program reduced late appearances by 70%. These were 1.3/1,000 before introducing the protocol and 0.47/1,000 after its use.

### DETECTION IS A DAILY JOB

Detection of CHD is the first responsibility of each pediatric orthopedic service and the early detection program will depend on geographic, economic and cultural factors<sup>25,28-33</sup>. Detection of CHD cannot be planned in the same way in Los Angeles, with a population of 19 million and in Ho Chi Minh City, with the same population.

In Ho Chi Minh City 300 children are born every day and detection cannot be compared with Montpellier, where there are 25 births per day. Geography is also important. Rural and urban areas must be distinguished and culture is also extremely interesting, in Russia it is the custom to bandage babies in adduction.

To conclude, we summarize the recommendations on which most of the publications reviewed coincide: 1) The whole world of health must be involved and constantly participate in early detection of CHD. Information, information and more information must be constantly provided<sup>14</sup>. 2) Prevention is more effective when supported by a methodic well done clinical exam in a maternity. This must be repeated regularly. Ideally the exam must be carried out by an orthopedic surgeon in the maternity and must be repeated during the first year of life by a pediatrician<sup>34</sup>. 3) Ultrasound imaging is an essential element in early detection, but it must be selective, especially when the results of clinical examination are suspicious, abnormal or ambiguous or when there are evident risk factors<sup>24,26,35-37</sup>. When the protocol is well organized, ultrasound imaging reduces the need for surgery by 2/3 and treatment by ?<sup>20,21,28,38,39</sup>. 4) Early detection protocols have risks and inconveniences, such as unnecessary treatment, repetitive exams and, sometimes, a perverse effect<sup>13,40</sup>. Clinical examination can occasionally be difficult and have poor results<sup>41-44</sup>. It is necessary to examine 2,000 hips to discover 10 abnormal hips (5/1,000 births). A pediatrician examines a mean number of 300 newborns per year, and so would theoretically require 3 years to find 10 dislocated hips or hips tending toward dislocation. With these figures it is no wonder that routine becomes the worst enemy. 5) A finding of normal hips does not mean that clinical exams should not be repeated during

the first year of life<sup>45</sup>. Small instabilities evolve favorably. And 60% of unstable hips become normal in the 1st week and 86% in the second month. 6) The Barlow<sup>26</sup> principle must never be forgotten. 7) It is advisable to remember that most dislocated hips have no risk factor. There is no risk factor in 39% of cases. Most newborns with risk factors present CHD<sup>44</sup>.

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