"Fettweis plaster cast", "Fettweis position" and "seated squat position" are terms that are forever linked with the name Fettweis when it comes to treating infant's hips. These terms belong to a "proprietary product". His bio-mechanically orientated treatment path has ensured that Dr. Fettweis has made a decisive contribution to improving the treatment results arising from infant hip dysplasias and luxations. Even though he is retired, or better to say "enjoying an active retirement", Dr. Fettweis is still fully concerned with the problem of infant's hips and Dr. Fettweis has sent us an extremely interesting article about carrying techniques used for infants. The article, which is written from a cultural and historical view as well as a bio-mechanical medicinal view, is extremely interesting and it addresses a day-to-day problem that many of us have to confront in our daily professional occupation. We do not want to deprive you of this interesting article

E. Fettweis

Carrying babies or toddlers in baby-carriers or shawls

Summary

Something about Carrying of Babies and Toddlers .

Carrying of babies and toddlers could be mostly recommended up to now because of the favourable effects on the development of the hip joints. Today this is also effected increasingly because of the bonding, the contact between carrier and the carried. The carrying mode used on this occasion partly contradicts the first intention. The biomechanical conditions, which are responsible for the favourable influence on the hip joints, are described.

Keywords: carrying babies and toddlers – DDH – bonding

Bodily carrying of babies or toddlers by the mother, father or even someone else is becoming ever more popular. Previously, anything like that was considered to be virtually exotic. Just a few decades ago, anybody doing this out in the street was looked at pityingly or even reproachfully and often spoken to by passers-by, who felt sorry for the infants that were being carried in this way, yet the author knows that this has been recommended to him by his own daughters. It was seen as even worse when a mother breastfed in public. In the meantime, this has become a normal street scene that is accepted by virtually everyone. The recommendation to carry infants, which is based on the article taken from the reference literature, covers the development in Japan (1), which results from the fact that earlier on there were hardly any hip luxations recorded there as the infants were carried on their mothers' backs and they were also allowed to crawl around at home and the number of hip luxations have increased as the population has moved away from their old customs and habits. It was this that initiated the development of hip luxation treatment in the seated squat position (2).

The carrying recommendation refers to the well-founded belief that carrying is the same as hip displacement prophylaxis and is needed for the post-natal development of the infant's hip joints. As an orthopaedic surgeon, I have no difficulty in supporting the question of carrying with regard to a baby.

However, carrying methods have been developed in the meantime, which I advise against as they are non-supportive with regard to an infant's hip joints. Today there are two different reasons for carrying children. The first reason is the aforementioned requirement regarding hip joint development.

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The second is what we now call "bonding" and this means the close link between the carrier and the infant being carried. In the case of mothers and fathers, there is often an emotional longing to hold the baby as close to them as possible and they also know that the baby will be calmer and happier whenever there is bodily contact with a parent. Psychologists and many children's doctors promote carrying for these reasons. The carrying methods recommended here frequently contradict the initial intentions. The following will show you the bio-mechanic conditions that are favourable for the development of the hip joints, so that responses can be facilitated for the relevant questions (4, 5 & 6). Indigenous peoples as well as many people from advanced countries, where carrying is traditional, know how to carry a baby "correctly", as it is passed down from generation to generation. Today there are many carrying consultants, who have often been trained at a carrying school. Here you can learn, if you want to use a shawl for carrying, which type of shawl is the best to use (e.g. regarding the material) and how you should bind it around you (see Appendix regarding carrying schools).

Fig. 1: Page taken from a publication released by Nagura in 1940 with 2 pictures. They do not show the Lorenz position.

There are also commercially manufactured baby-carriers available for use and instruction from a consultant is often available as well (Figs. 1, 2). It had long been thought that hip displacement first occurred when starting to walk due to an inherent "fleeing socket", which cannot hold the femoral head pressing up against it (3). Today it is generally accepted that luxation mainly occurs after birth, when the legs in the hip joints are stretched too early and too quickly out of the maximum prenatal folded position and then dislocate due to the socket's inadequate "bone shaping". A normal socket consists of cartilage, which slowly changes into bone. This process advances at different rates in babies from the time of birth, which means that the bone formation often develops inadequately (4). Carrying, whether in the traditional Japanese way or as still practised by other peoples, is now considered to be the ideal method for preventing early stretching of the legs and it also ensures that the femoral heads are centred in the sockets and this promotes the ossification of the socket's cartilage. Preventing early stretching or stretching too severely and promotion of the centring can be realised by using a shawl, as this can be stretched tightly across the back of the knees. The gluteal muscles, which stretch the hip joints during unrestricted movement, cannot be deployed by this restriction and neither can stretching take place. In addition to this, centring ensures that it bulges during every contraction

Fig. 2: An African woman carrying her child at the front, to the side and on her pelvis. The hip joints are spread over more than 90°. The shawl is tight above the knee joints. This is the ideal carrying position for the hip joints.

Fig. 3: Infant carried on the stomach, facing the mother in a commercially manufactured baby- carrier. This position encourages the development of the hip joints: Excellent 90° leg bending, spreading within the spreading range and the carrier ends just above the knee joints.

and this effectively presses the femoral neck and the femoral head in the direction of the socket (Fig. 3). One can easily imagine the following: If you bend your elbow you will feel the movement of your bicep muscle. If you then use your other hand to obstruct the bending movement, then you will feel a distinct bulging in your bicep muscle. Eventual ossification of the socket is ensured by even pressure distribution over the head and the cartilage socket and this creates hydrostatic pressure and this induces the changing of the cartilage into bone. Every attempt to stretch the legs inside the carrying shawl is therefore both an action that ensures good centring of the femoral heads as well as action that promotes maturing, i.e. it encourages the ossification of the sockets. At the end of the 60s / start of the 70s, the author noticed that infants who were placed in the face-down position, frequently showed hip displacement signs. The trend at the time, which came out of America, was to lay infants down on their stomachs. This was in direct contrast to my recommended seated squat position. This gave rise to a brief literary and scientific controversy (6, 7 & 8). The bio-mechanic conditions described here were unknown or were unfamiliar in general. This explains belatedly why infants laid down on their stomachs are prone to hip luxation. The hip joints are stretched passively in this position and the glutens are rendered virtually inactive with regard to the favoured effect described here. What should now be considered as the preferred degree of bracing apart and bending? With regard to the Japanese method of carrying a baby on the back as mentioned by the Japanese author (1), it would appear that the favoured Lorenz position was developed from it. The illustrations used in his publication do not show this (Fig. 1). In neither case was it 90°, it was considerably less in fact. In addition to this, small infants were also carried by older sisters with smaller backs. The most common carrying method is sideways “on the hip”, as well as on the pelvic ridge, where the bending is normally greater than 90° (Fig. 3). Subsequent research has determined that bending between 110° to 120° and bracing apart of 40° is particularly beneficial as the

Fig. 4: Shows two different ways of carrying at the front on the stomach, facing the mother on the left and turned away from the mother and being carried in a commercially manufactured baby-carrier on the right. Neither of these positions is needed for the development of the hip joints. The legs are stretched in the hip joints. This is considered to be similar to the prone position.

femoral neck axis is positioned almost vertically to all of the socket entry levels and this guarantees the most favourable bone forming conditions (9). Furthermore, the degree of bracing apart and bending, both preferred and actually implemented, naturally depends on the infant's age and the physical dimensions of the person carrying the infant. We should also differentiate between the optimum sizes and fluctuations with regard to these values. This is comparable to the recommended speed limits on a motorway. The abduction should never exceed 55°. Adduction outside the centre position is harmful to the hips, as the femoral head will then be pressed up against the roof of the socket and might even damage it. If you take a close look at these bio-mechanical carrying conditions with regard to the hip joints, it is easy to judge which specific carrying methods are good for the hip joints and which ones should be avoided. Carrying on the back with the infant facing the person carrying it and with its legs akimbo is favoured. Carrying on the back facing in the opposite direction is only possible with stretched legs and the legs will be stretched by their own weight. The infant is virtually unable to bend its legs and the glutens will be partially inactive with regard to their beneficial function. This is similar to laying in the prone position. Carrying on the stomach with the infant facing the person carrying it will involve the legs hanging down and being stretched and is harmful in this respect. There are also carrying techniques in which the shawl is knotted in such a way that the legs are bent and spread and this meets our requirements. Appropriate baby-carriers are available for this (Fig. 3). Carrying on the stomach with the infant facing away from the person carrying it is defined as being analogous to the carrying on the back method and it should be avoided (Fig. 4). Carrying sideways on the hip with 90° or more leg bending and the correct spreading is preferable (Fig. 2). A special position is the cradling position, in which the infant lies across the stomach (Fig. 5). In this case the legs are only slightly bent, which leads to the risk of adduction in one or both of the legs. Cradling is recommended during the first days after birth.

However, infants can also be carried in the upright position soon after birth provided that the correct binding technique is used and support for the head is provided together with increased hip flexion. There are certain nuances to which particular attention must be paid when carrying an infant. This applies in particular to ensuring that the knee joints are able to move. The latter should be free to move at all times. Depending on the method that is used to wrap the shawl around the person wearing it, it is possible for the first turn of the shawl to go under the knee joint and prevent any knee movements. This will result in continuous elongation of the ischiocrural muscles and this continuous elongation plays a specific role in the occurrence of hip luxation in breech births. The arms should always be free to move and the respiratory system must never be obstructed. The infant should never be more restricted than is absolutely necessary. The infant will be delighted with his/her range of movements

that have developed after 9 months. This happiness can be seen in the amount of mimicking and kicking! Another problem is the effect of the carrying on the person carrying the infant. This primarily affects the spine. This also depends on whether the weight of the infant is transferred to the shoulder or the torso. The first usually occurs when carrying on the hip. This will be particularly awkward if the person carrying the infant has scoliosis or if there are problems with the cervical spine. You can always move the infant over to the other side. Carriers that distribute the weight equilaterally over the pelvis have been developed recently. Quite often the shawl is knotted at the front on the stomach and M. E. should carry out special research into this.

Comments about carrying schools and carrying consultants

Carrying schools are not bodies subject to public law. They are private companies, which usually have protected names and logos. They see their job as expanding the use of carrying and training the people who will be carrying the infants. Being a carrying consultant is not a recognised occupation. They have gained their capability and knowledge through self-learning from reading the literature (10), making contact with other people and by attending courses given in carrying schools.
The latter issue certificates upon completion, which means that as carrying consultants they have the right to display the logo of the respective carrying school. They are recruited from various professional groups, such as children's nurses, midwives or even interested mothers. Some carrying schools:

- Die Trageschule®, carrying consultant's network: www.trageschule-dresden.de

- NRW carrying school: www.trageschule-nrw.de

- Mettmann carrying school: www.trageschule-mettmann.de

- ClauWi – children's toys, sibling preparation courses and carrying school®: www.clauwi.de

The carrying schools have presently created a network of trained consultants. "Die Trageschule Dresden®", which is top of list shown above, has an international network of more than 400 consultants in 15 European countries. It provides inter-disciplinary exchanges and invests in relevant publications. Medicinal standards relating to the general carrying of infants, but with regard to special situations have been and are being established. The carrying school has its own medicinal advisory board and it hosts a symposium called the "Dresdner Carrying Days" every 2 years. They also produce an online newsletter. Addresses can often be obtained from midwives.

Fig. 5: Shows the so-called cradling position. The leg positions cannot be assessed. The risk exists that one or both of the legs will go into adduction and this situation is dangerous as pressure will then be placed on the roof of the socket, but on the other hand this position is good for new-born babies. However, babies can be carried in the upright position immediately after birth in specific commercially manufactured baby-carriers if the relevant development techniques are used.

Literatur

1. Nagura, S.: Angeborene H□ftverrenkung und Volksgewohnheit. Zenralbl. Chir. Nr. 23 (1940) 1042 □1050.
2. Fettweis, E.: Sitzhockstellungsgips bei H□ftgelenksdysplasien. Arch. Orthop. Unfall-Chir. 63 (1968) 38 □51.
3. Lorenz, A.: Die sog. Angeborene H□ftverrenkung. Ihre Pathologie und Therapie. Enke Stuttgart,

1920.

4. Fettweis, E.: Die Behandlung des kindlichen H□ftluxationsleidens in Sitzhockstellung nach Fettweis in D. T□nnis (Herausgb.): H□ftluxation und H□ftkopfnekrose. Enke Stuttgart (1978) 30 □53.
5. Fettweis, E.: □ber muskelmechanische und biomechanische Bedingungen der Sitz-Hock-Stellung bei der Behandlung des kindlichen H□ftluxationsleidens. Orthop. Praxis 8 (1991) 477 □481.
6. Fettweis, E.: Zur Prophylaxe des kindlichen H□ftluxationsleidens Z. Orthop. 109 (1971) 905 □911.
7. Mau, H.: Bemerkungen zu E. Fettweis: □Zur Prophylaxe des kindlichen H□ftluxationsleidens.□ Z. Orthop. 110 (1972) 270 □271.
8. Fettweis, E.: Erwiderung auf die Bemerkungen von H. Mau □ber die Arbeit des Verfassers □Zur Prophylaxe des kindlichen H□ftluxationsleidens.□ Z. Orthop. 110 (1972) 272 □275.
9. B□schelberger, H.: □tiologie, Prophylaxe und Fr□hbehandlung der Luxationsh□fte. Beitr□ge zur Orthop□die und Traumatologie 11 (1964) 535 □548.
10. Kirkilionis, E.: Ein Baby will getragen sein. K□sel, 1999.

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