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MASTERTHESIS

The significance of osteopathic interventions

in the treatment of congenital hip dysplasia

(Type IIa/IIb)

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1. Introduction

There were 2 considerations in my search for a dissertation theme: The first consideration was the practicability of the work and the second consideration was the possible resulting consequences for daily work in practice.

Following many futile attempts, it was these two criterion that led me to my current theme and also allowed me to work with a favourite client group of mine – children.

Is it possible to positively influence development of an infant's hip joint through osteopathic treatment, following a diagnosis of congenital dislocation of the hip, and consequently to achieve a better development of the hip joint?

History:

Hippocrates (approx. 390 bc.) knew that there was a congenital form of hip joint luxation and Ambroise Paré (1840) was the first to identify that the inadequate development of the joint socket played an important role.

Following investigations by v. Rosen (1969)[1] and Barlow (1962)[2], an early diagnosis of congenital hip dislocation immediately following birth can assist towards an almost complete anatomical healing if the adequate treatment is immediately provided. Becker (1979)[3] and Schultheiss (1965)[4] state that if the first treatment starts after the person is 25 years old, only approximately 2/3 cases are fully healed and also Smergel, Losik and Rosenberg (2004)[5] point out the importance of early diagnosis and treatment of congenital hip dislocations.

If my work shows a significant difference between the osteopathically treated group and the control group, then this will have important and direct consequences for my practice.

[1] V. ROSEN, Early diagnosis and treatment of congenital dislocation of the hip joint **[2]**
[2] BARLOW, Early diagnosis and treatment of congenital dislocation of the hip **[3]**
[3] BECKER, Probleme und Gefahren der funktionellen Behandlung dysplastischer Hüftgelenke **[4]**
[4] SCHULTHEISS, Frühbehandlung der Hüftdysplasie durch atraumatiche Spreizung **[5]**
[5] SMERGEL, LOSIK and ROSENBERG, sonography of hip dysplasia **[6]**

When searching for similar studies related to this theme on the Internet and through professional discussions with colleagues and professors, I only came across one study, carried out by a German colleague, Frau R. Weiss[6].

In this study 29 infants suffering congenital hip dislocation were treated with osteopathy.
In the control group there were 25 infants whose nappies were worn wide. The results of this study did not show a significant difference with regards to time or quality. However, Fr. Weiss admitted that her study included several factors which could have influenced the results and which raised several questions about the research:

- osteopathic techniques were mostly used on the pelvis and hip joint
- the treatment group was too small
- the chosen congenital hip dislocation type IIa had a tendency to self heal.

Subsequent studies then, of course, should take these questions into consideration - which I tried to realize in this study.

[6] WEISS, Einfluss osteopathischer Techniken auf den Heilungsverlauf einer Hüftreifestörung (Dysplasie) im Säuglingsalter **[7]**

Aim of the Study

In the following dissertation, I want to verify whether a faster and better development of an infant's hip joint through osteopathy is possible, and if so, to put forward osteopathy as an effective treatment method complementing and supporting the already well known orthopaedic therapy concepts, such as wearing extra wide nappies.

This would also then be valid as a treatment form for more severe forms of congenital hip dislocation, such as type III. This form of dislocation was not researched in this study and an explanation why is to be found in the following.

2. Anatomy/Biomechanics/Embryology

2.1 Anatomy

A brief overview of the anatomical relationships of the hip joint should be sufficient to understand the most important factors and their combination.

Primarily, the size relationship of the head of the femur to the acetabulum, having a good covering and having extraordinarily strong ligaments and many muscles all ensure contact maintenance and a good central positioning between the head and the socket, in addition to great stability in the hip joint.

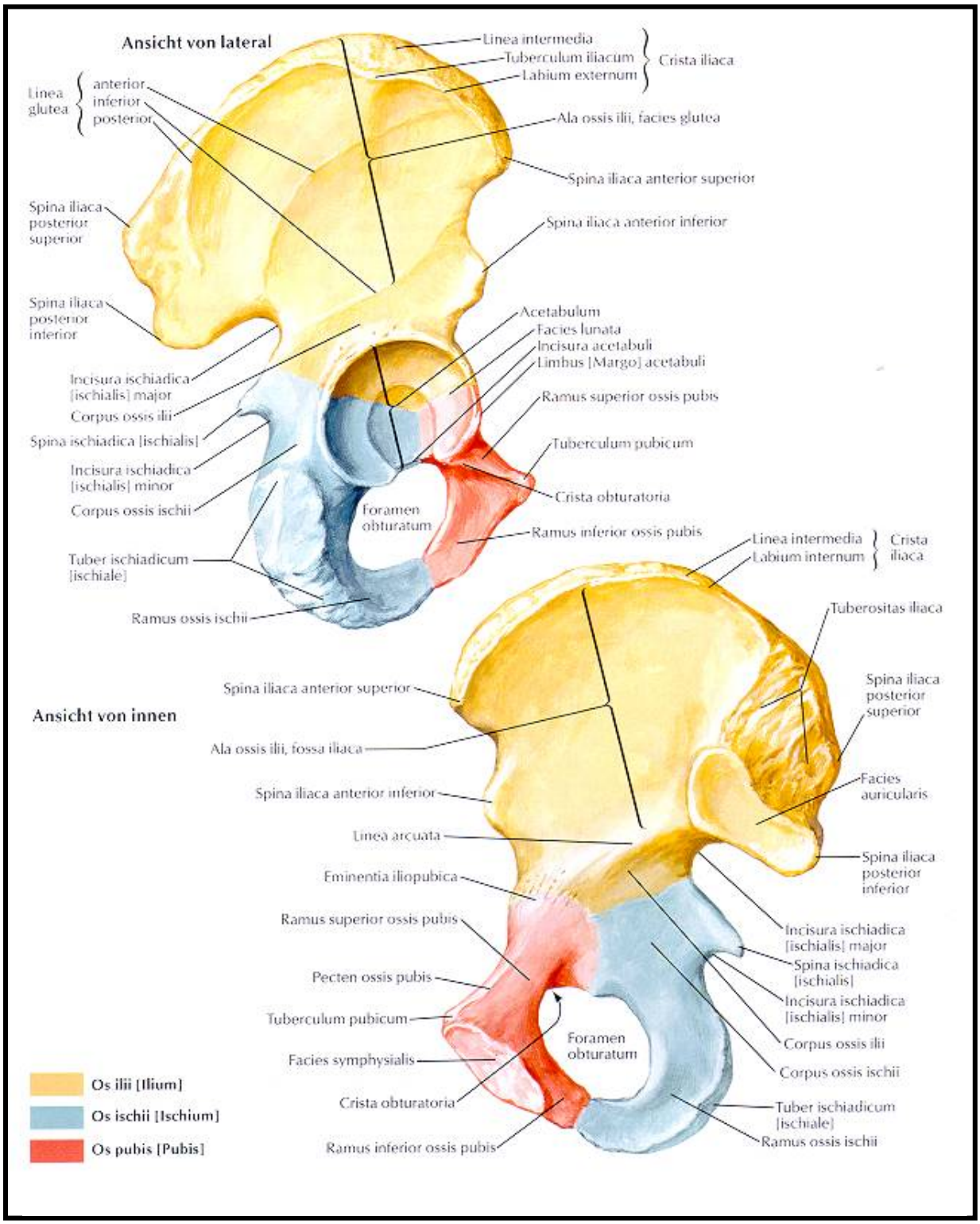
In order to deepen understanding and for treatment of congenital hip dislocation, I believe that the embryological development is extremely important, of which a detailed description can be found later in this dissertation.

2.1.1 osseous factors

The hip joint consists of the coxal bone. Its 3 parts (ilium, pubis, ischium) form the joint socket (acetabulum) for the femoral head (Platzer 1984)[7].

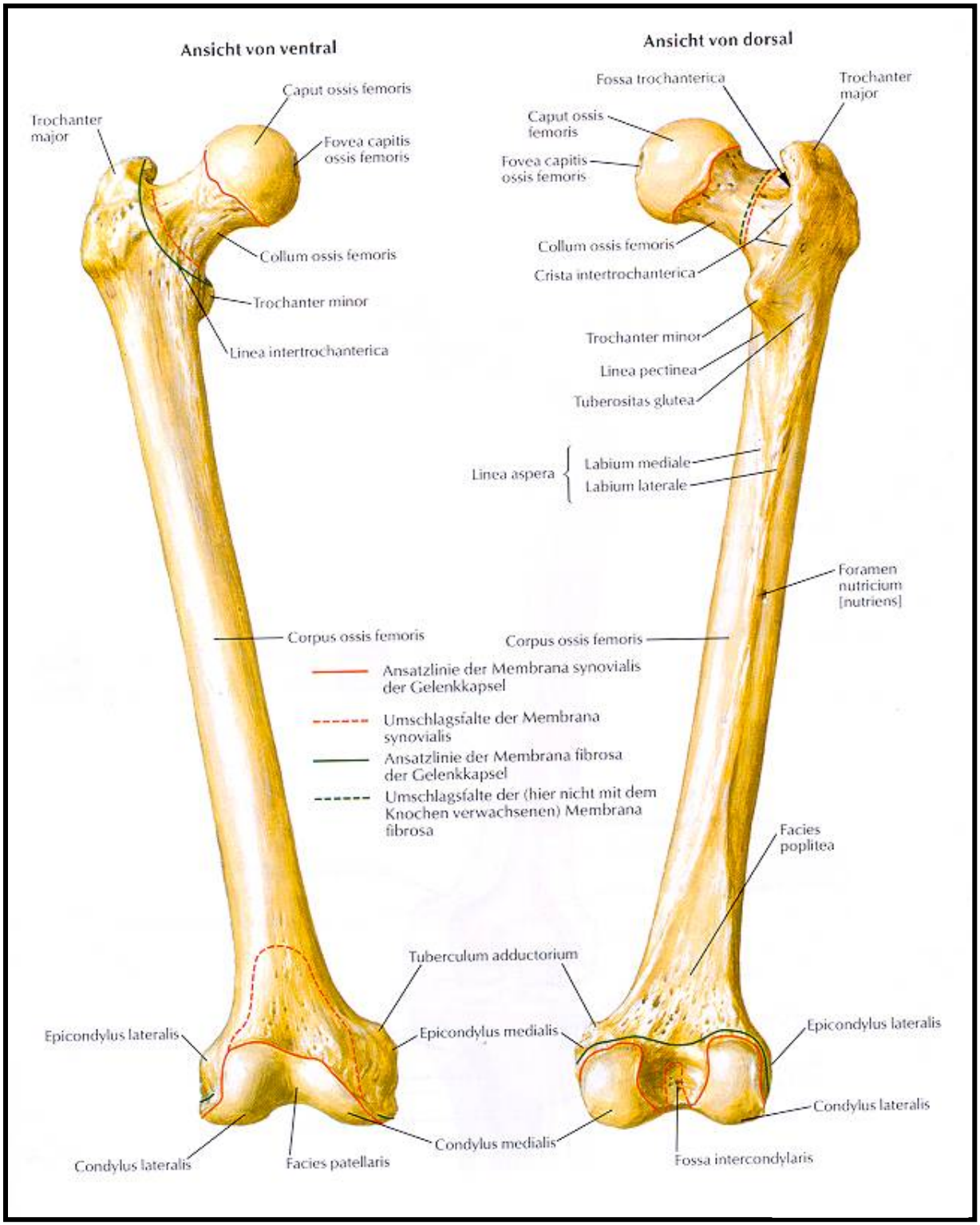
[7] PLATZER W. Taschenatlas der Anatomie, Band 1, 4. Auflage, Thieme 1984 **[22]**

This illustration clearly shows the osseous part of the os coxae (os pubis, os ilium and os ischii) and their interrelation.



Ill. 1 Os coxae (Netter **[1]**)

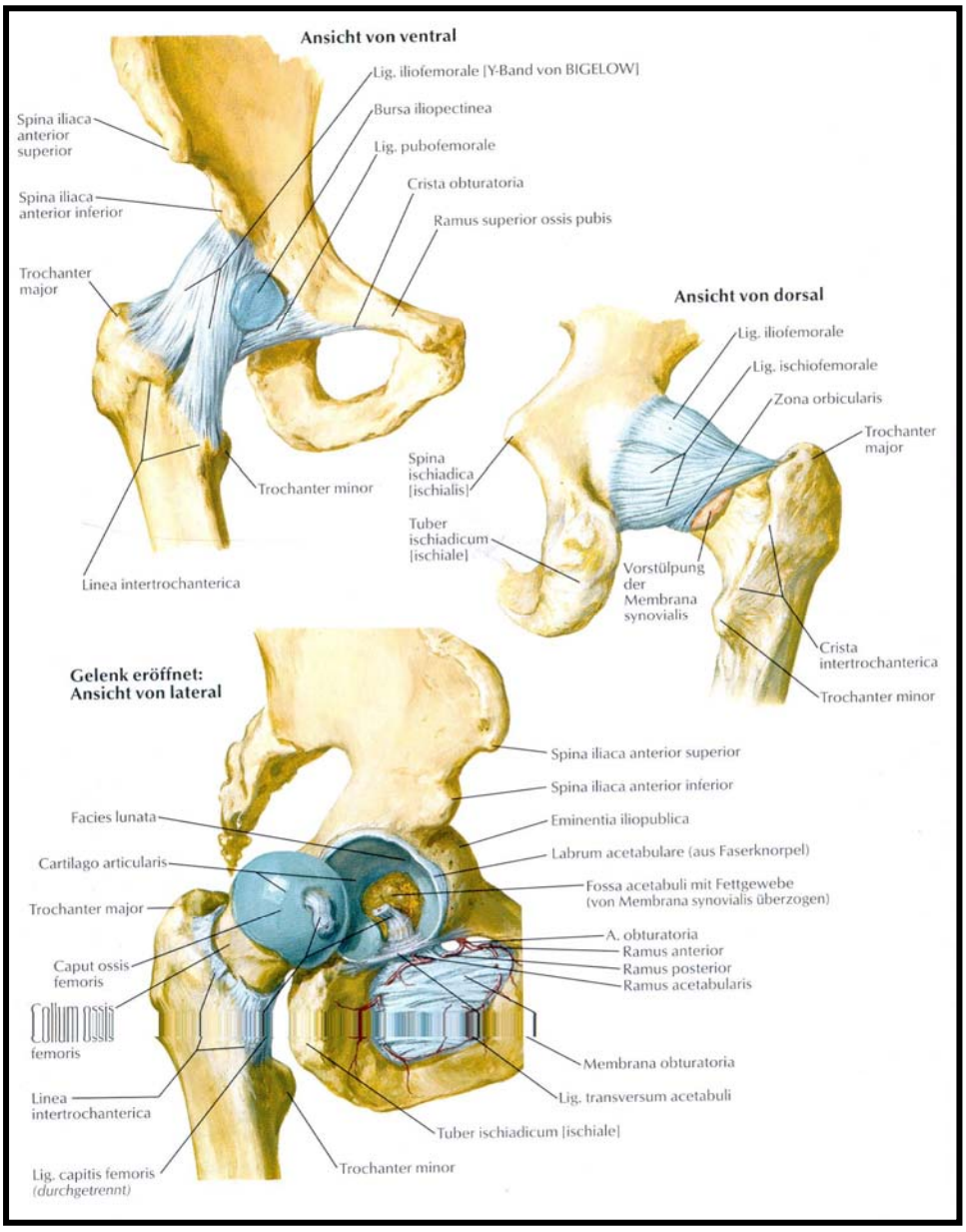
The femur – as figured – constitutes along with the os coxae the second osseous partner of the hip joint.



Ill. 2 Femur (Netter **[1]**)

2.1.2 Ligaments

Ones to be mentioned are the iliofemoral lig. (strongest ligament in the human body), the zona orbicularis and the ischiofemoral and pubofemoral lig. The Lig. Capitis femoris progresses intracapsularly. The ligaments, which partly strengthen (support) the joint capsule, not only have limiting function but also, together with the muscles, function to guide joint movement.



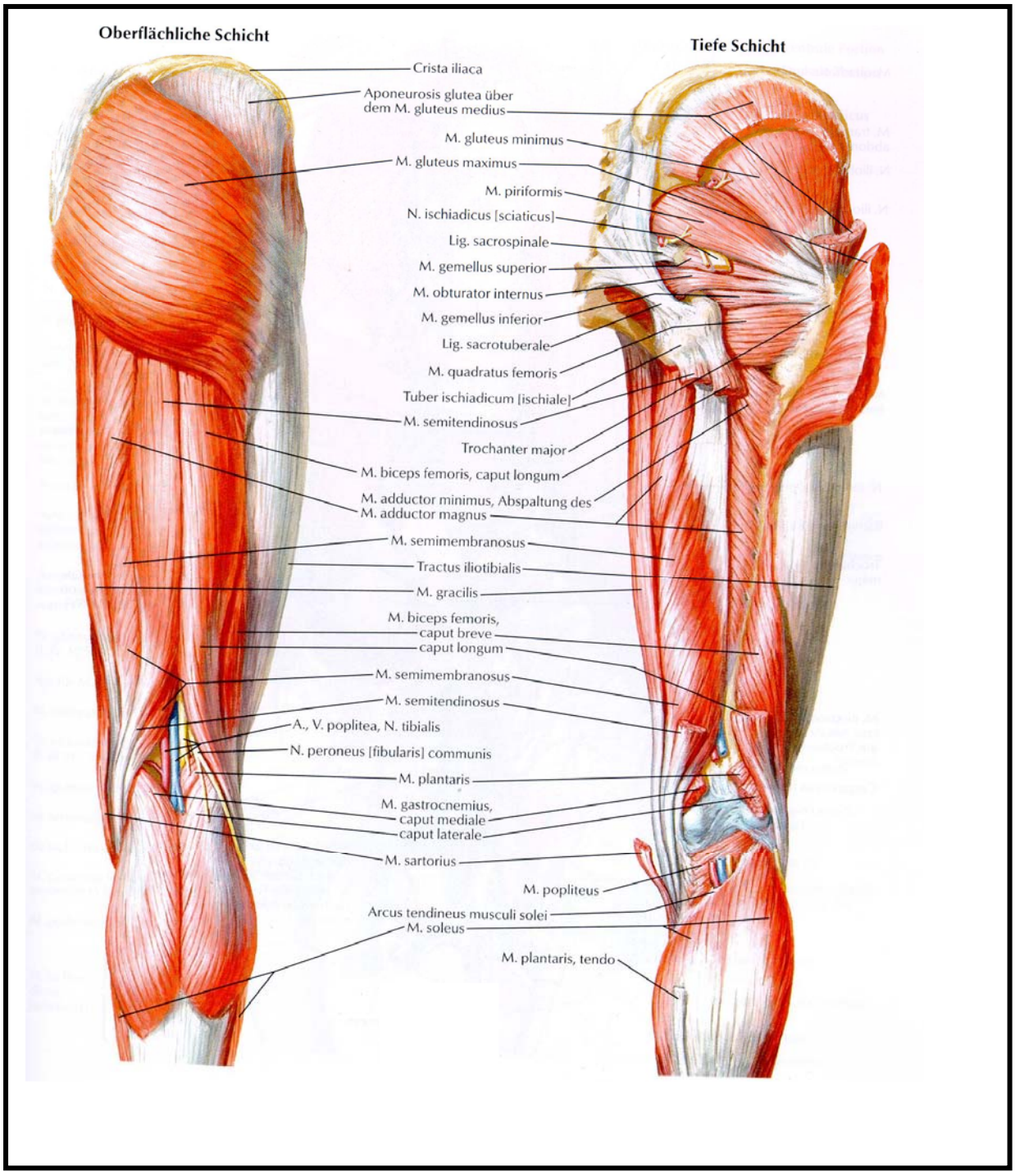
Ill. 3 Articulatio coxae (Netter **[1]**)

2.1.3 Muscles

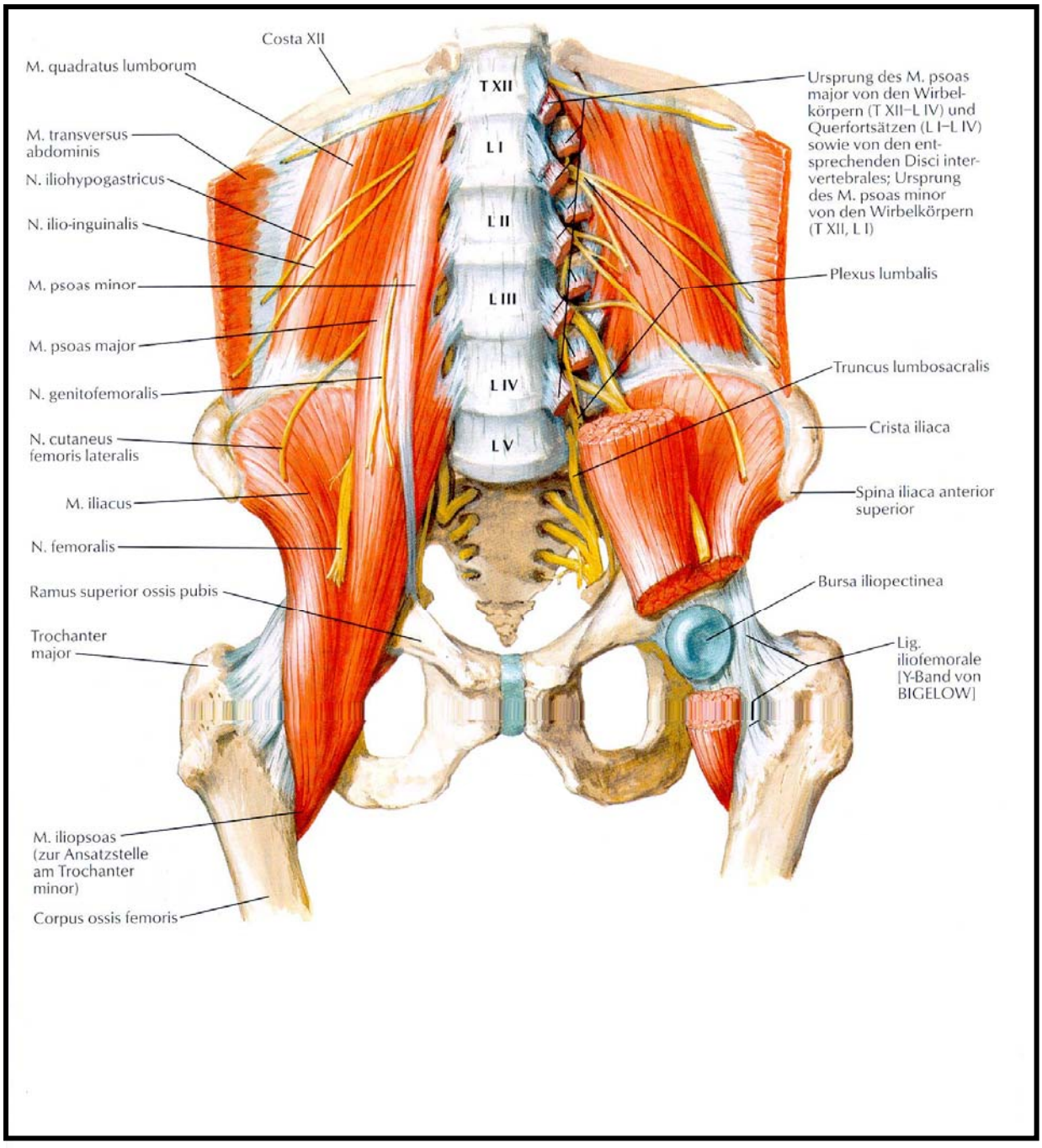
To detail all the individual muscles here would be, in my opinion, unnecessary. For a more thorough analysis of the anatomic and muscular status of the hip joint I suggest “Atlas der Anatomie des Menschen” of F. Netter 2 edition Thieme 2000. Two illustrations should be sufficient in order to gain an overview.

When examining them, one will obviously recognize how complex the functional interactions of the lumbar spine, the pelvis and the lower extremities with their partially multiarticular muscules are.

This inevitably means for me to consider the dysfunctions of the hip joint not only monoarticularely but also to turn to a functional way of treatment – as especially osteopathy offers and even orders.



Ill. 5 Psoas and iliacus muscles (Netter **[1]**)



Ill. 5 Psoas and iliacus muscles (Netter **[1]**)

2.1.4 Circulation

The arterial supply of the hip joint takes place via the capitis femoris artery of the R. acetabularis a. obturatoriae, arising from the A. obturatoria and the Aa. circumflexae femoris from the A. profunda femoris. They all arise out of the A. femoralis.
The Aa. cirmumflexae iliaca profunda et superficialis, which also help to nurture the area, come directly from the A. iliaca externa. Drainage works through the respective venous system via the Vv. iliacae and further through the inferior V. cava. Lymphatic fluid is transported through the Nodi lymphatici inguinales, iliaci and Aortici and is taken from there to the Cysterna chyli (Platzer 1984)[8].

2.1.5 Nerve supply

The hip joint is innervated with fibres from the lumbar plexus and from the sacral plexus.

[8] PLATZER W., Taschenatlas der Anatomie, Band 1, 4. Auflage, Thieme 1984 **[22]**

2.2 Biomechanics[9]

2.2.1 Muscular:

Every muscle not only has a movement component, but also a compressive momentum (coapatative force). The balance of these two parameters is considered as one of the most important criteria in the prevention and treatment of Coxarthrosis.

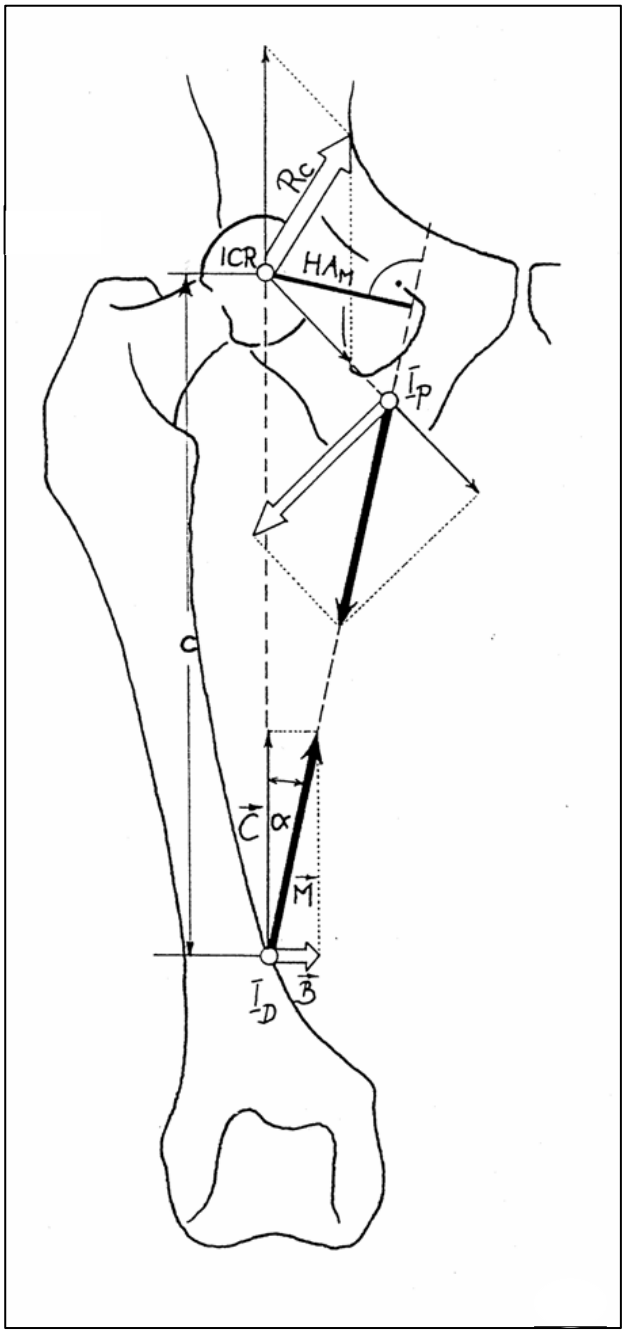
Factors to be recognised and treated are those which disturb this sensitive balance or to use biomechanical language, those which change the vectors of the different muscles.

Because of their importance for leverage, the following muscles are of particular importance:

M. psoas, Mm. Adductores, Mm. Glutei.

Dysfunctions which normally disturb this well-balanced system can lie at a musculo-skeletal level, as well as at a visceral or cranio-sacral level and make it absolutely necessary to find a holistic osteopathic treatment approach and to leave behind thinking models of local, mono-arthicular and mono-structural character.

[9] KLEIN P., Biomechanik des Hüftgelenkes, WSO 1994 **[8]**

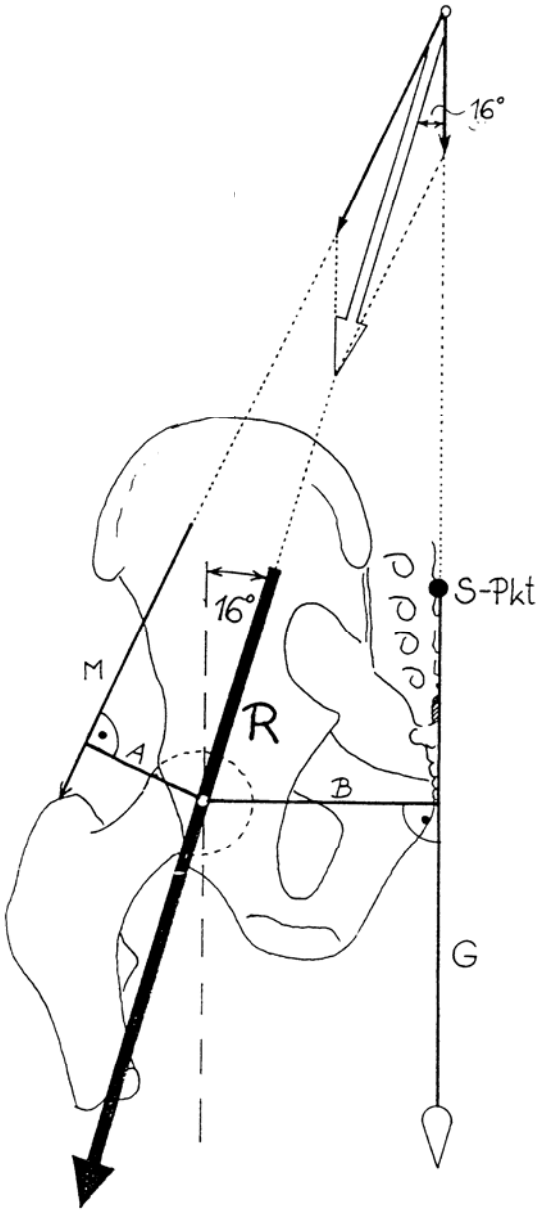


Ill. 6 muscular coaptative component (Klein **[8]**)

2.2.2 The Resulting force:

The direction and intensity of the joint force during stance is defined in Pauwel's equilibrium model and is dependent on the following factors:

- the force through the centre of gravity
- the muscular forces
- the capsular-ligament forces



Ill. 7 The direction of the resulting force (Klein **[8]**)

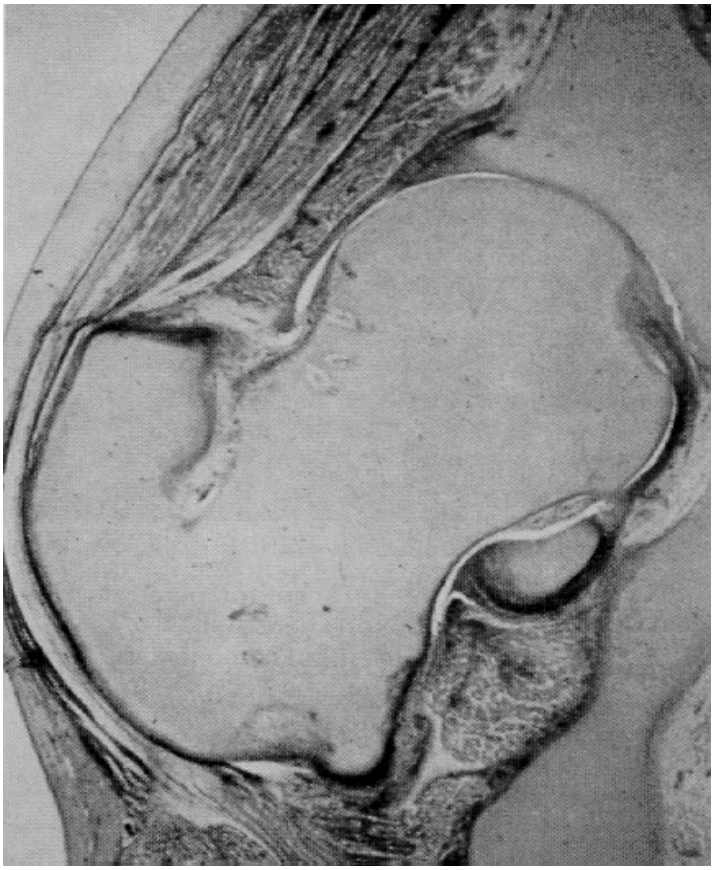
2.2.3 The concordance of the joint surfaces:

The concordance of the joint surfaces is dependent on the congruence of the two radii of curvature of the femoral head and the acetabulum and on their shared centre of curvature.

An insufficient covering of the femoral head, as occurs with congenital hip dysplasia, leads to a discordance and therefore a change of the force relationships, producing shear forces which, in turn, lead to increased wear and tear in this joint.Because the laws of biomechanics are valid for every year of life, they must not be ignored in the treatment of infants.

2.3 Embryology[10]

As early as the sixth and seventh week, the 3 cartilaginous structures (os ilium,os, ischii and os pubis) unite to form one cartilage and develop the acetabulum. In the 7th week the joint capsule and the Lig. capitis femoris form and the femur shaft ossifies. The early development of the hip joint is completed. The first centre of ossification arises in the tenth week in the os ilium, in the os ischii in the sixteenth and in the os pubis in the twentieth week, where the osseous parts are joined through a Y-juncture. Synostosis takes place between the fifth and the seventh year of life. However, within the acetabulum, this occurs in the fifteenth year of life, where more ossification centres develop (acetabulum) between the age of 10 and 12. In the tenth foetal month an enchondral centre of ossification can be seen in the distal epiphysis and, in the first year of life, in the femur head. In the third year of life it can be seen in the trochanter major and in approximately the eleventh year of life, in the trochanter minor.



Ill. 8 Microscopic view of an embryological hip joint (Graf **[11]**)

[10] ANDERHUBER, Embryologie und Morphogenese **[9]**

3. Definition/Diagnostics/Classification/Therapy of the congenital hip dysplasia

3.1 Definition

The bony roof of the hip joint develops further postpartally, though it should be noted that the form differentiation has the highest growth potential in the first 6 weeks of life. This starts to level out by 1 week and levels out in a proportional growth of femoral head and acetabulum from the 16th week onwards (Matthiessen 1997)[11].

Early diagnosis and rapid intervention are clearly essential. The term, hip dysplasia, is aimed at the abnormal development of the socket and is unrelated to age. Since acetabular development, to the degree that is normal for a 4-week-old baby, is pathological for a 4-month-old child, Graf postulates the term "developmental dysplasia of the hip". [12]

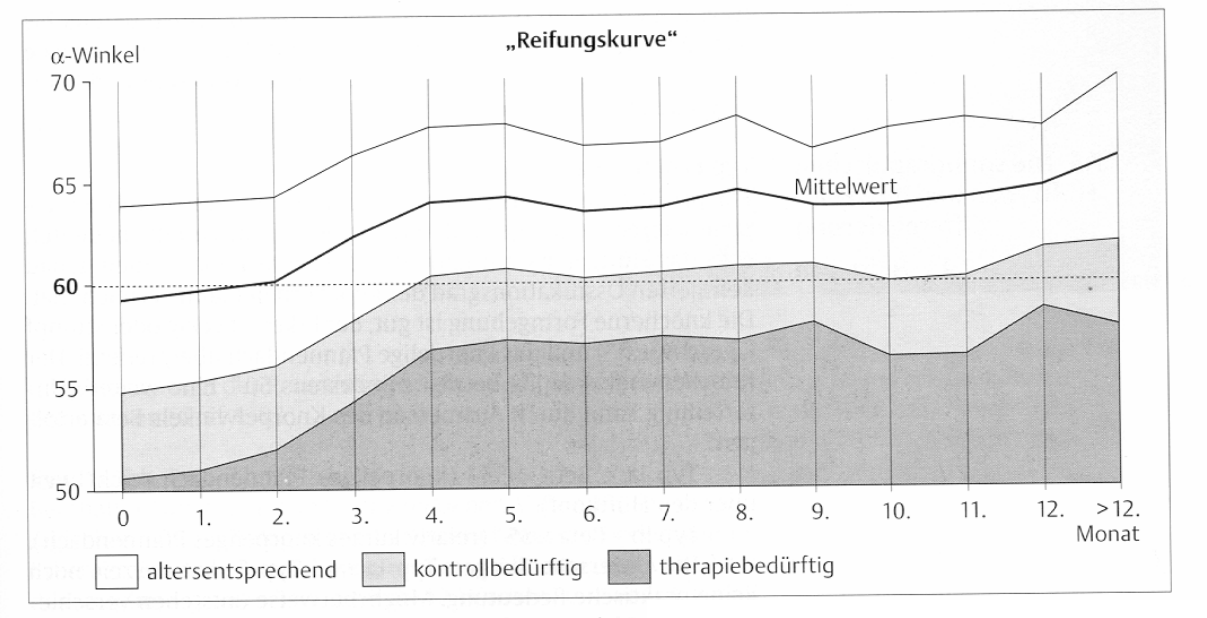
Depending on whether the femoral head is congruent with the acetabulum or not, it is recommended to term the joint "centred" or "de-centred".

With the help of sonographic assessment, the degree of development of a hip joint can be plotted as a development curve (Tschauner et al. 1993)[13].

Explanation of the shown angles Alpha and Beta follows in chapter 3.3.

[11] MATTHIESSEN, Dysplasie- und Theapiefaktor bei der Hüftreifungsstörung **[10]**
[12] GRAF, Sonographie der Säuglingshüfte und therapeutische Konsequenzen **[11]**
[13] TSCHAUNER, Der spontane Verlauf der Pfannendachentwicklung **[12]**

It can be derived from this whether a hip joint is in need of treatment or not.Classification of developmental delay allows for an exact choice of therapy, a relatively reliable diagnosis and an optimal control of progress.



Ill. 9 development curve (Graf **[11]**)

3.2 Diagnostics

3.2.1 clinical diagnostics:

- An abduction restriction of 10°, either comparing sides or both sides
- Difference of skin folds
- The Roser-Ortolani-sign, described as a clear click produced through luxation and repositioning of the femoral head when adducting and abducting the leg at the hip joint.

Although these and other clinical investigation methods are worthwhile, they are insufficient as criteria for a diagnosis of congenital hip dislocation. Various investigations, e.g. Ryder et al. (1962)[14], have shown that proportion of error is too high to rely solely upon clinical tests.

3.2.2 X-Ray diagnosis:[15]

X-rays are useful for the exclusion of femoral head necrosis and are indicated with an unclear sonographical assessment. However, they have certain problems:

- radiation contamination

- only little power of evidence up to the age of 3 month, because it is only possible to assess the already ossificated parts of the hip joint

- changes in positioning of the baby may produce interpretation errors

3.2.3 CT/MRI:

High power of evidence but expensive and the procedures for carrying out tests are difficult as the child must keep still.

[14] RYDER, The infant's hip normal or dysplastic? **[13]**
[15] GRAF R., Sonographie der Säuglingshüfte und therapeutische Konsequenzen, 5. Auflage, Thieme 2000 **[11]**

3.2.4 Sonography:

The sonographical procedure was developed for diagnosis of developmental dysplasia of the hip by university professor Dr. med. Reinhard Graf in 1980 at Stolzalpe hospital.

In Austria in 1992, the hip sonography was carried out as a screening process and is actually the gold standard for the examination of the infants hip in order to early diagnose congenital hip dysplasia.[16]

The advantages of the sonographical investigation include low costs and a high reproducibility. In addition, there is no radiation contamination and the procedure is non-invasive.

However, Graf himself pointed out that results may be misrepresented through tilting the sonographic head and he also highlighted other sources of error.[17]

Prof. Dr. med. Fritz of the children's orthopaedic university clinic in Basel judged the reliability as follows: "Was die Zuverlässigkeit der Messungen betrifft, weisen tatsächlich sowohl die Winkelmessungen wie auch die Beurteilung der einzelnen morphologischen Kriterien einzeln für sich eine schlechte Reproduzierbarkeit auf. Beurteilt man jedoch das Gesamtbild, so ist die Einteilung leicht vorzunehmen, und erfahrene Untersucher zeigen, wenn es darum geht, den Typ festzulegen, eine sehr hohe Übereinstimmung."[18]

In other words, angle measurements, as well as judgement of the morphological criteria per se, show bad reproducibility. However, if you assess the whole picture, classification is quite easy and experienced assessors show very high inter-tester reliability when it comes to classifying the type of hip dysplasia.

[16] DORN, NEUMANN, Ultrasound for screening developmental dysplasia of the hip: a european perspective **[14]**
[17] GRAF, Sonographie der Säuglingshüfte und therapeutische Konsequenzen **[11]**
[18] HEFTI, Kinderorthopädie in der Praxis **[15]**

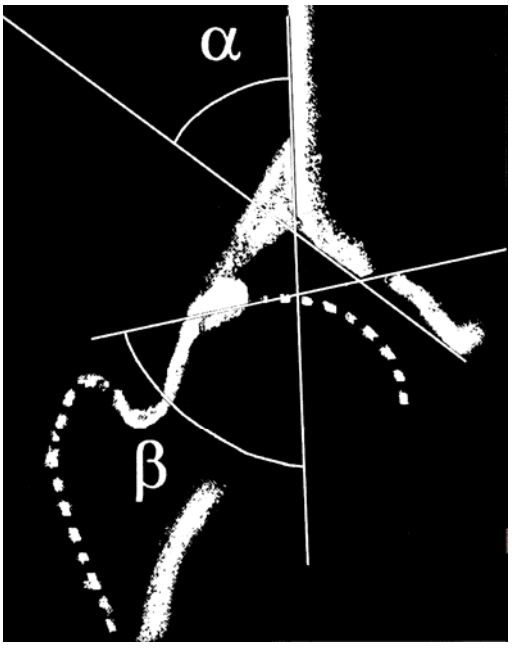
3.3 Classification of the developmental dysplasia of the hip

Graf (2000)[19] has introduced two angles for classification:

- the alpha-angle, which is found between the angle of the acetabulum, the Y-juncture and the lateral border of the iliac bone. It is also called the osseous angle alpha, since it allows assessment of the bony shape of the acetabular roof.

- the beta-angle, which is found between the lateral border of the iliac bone and a line connecting the angle of the acetabulum and the labrum of the acetabulum, also called the cartilage-angle. This angle provides information about the cartilaginous shape of the acetabular roof.

To define the two angles mentioned above, one also needs a base line that runs from the top of the bony roof down along the silhouette of the iliac bone.

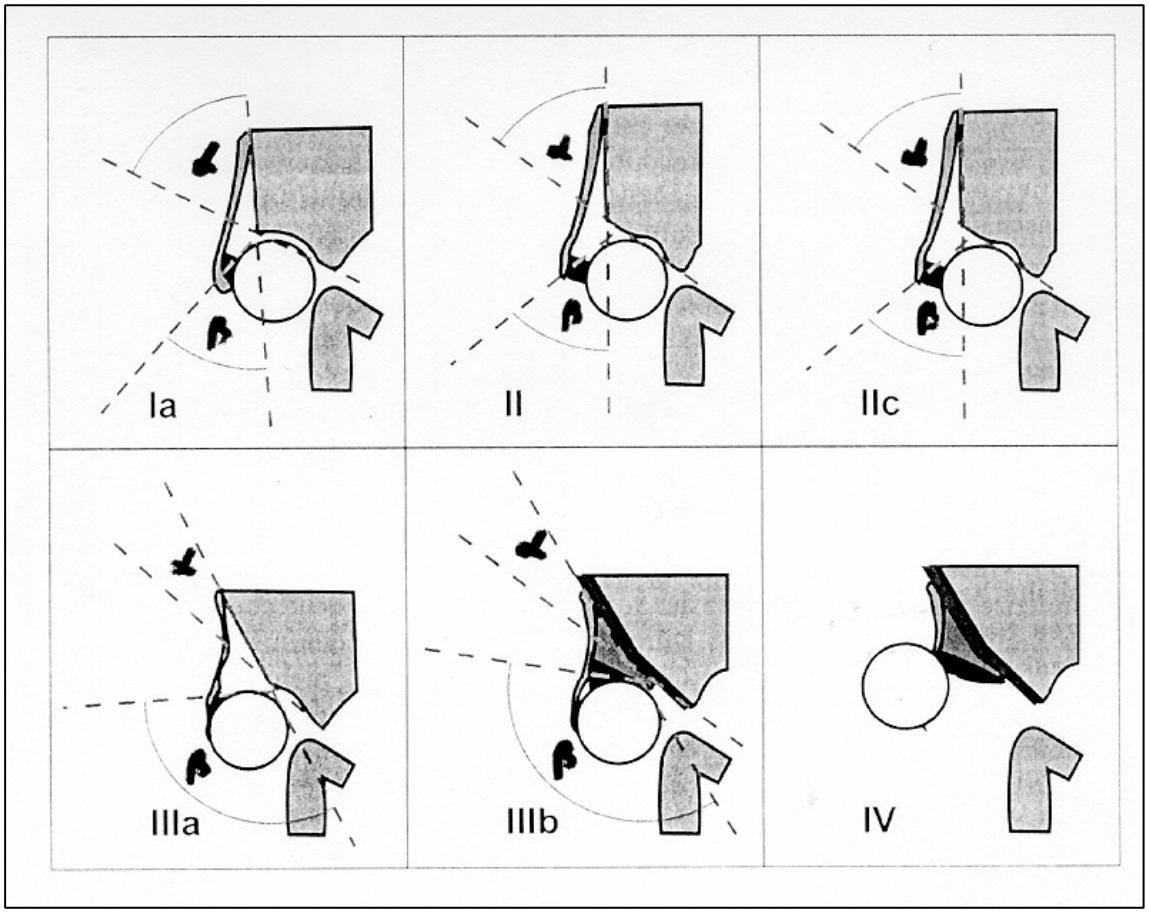


Ill. 10 line of the acetabular roof, cartilage line, base line (Graf **[11]**)

[19] GRAF R., Sonographie der Säuglingshüfte und therapeutische Konsequenzen, 5. Auflage, Thieme 2000 **[11]**

Furthermore, Graf (2000)[20] has suggested a way of classification that takes into consideration the different types of hip joints according to centralisation of the femoral head, development of the bony acetabular roof, degree of verticalization of the acetabulum and age of the patient.

This leads to the classification of hip types described below, where Type Ia/Ib represents a normal status.



Ill. 11 Classification of developmental dysplasia of the hip – diagrammatic presentation (Hefti **[15]**)

[20] GRAF R., Sonographie der Säuglingshüfte und therapeutische Konsequenzen, 5. Auflage, Thieme 2000 **[11]**

Hip type	Bony shape bony angle α	acetabular angle	cartilaginous acetabulum cartilage angle β
TYPE I mature hip joint Every age	good α = 60° or greater	angular/obtuse	overlapping Ia → β< 55° Ib → β> 55°
TYPE IIa (plus) Physiologically immature→ according to age < 12 weeks	sufficient α = 50 – 59° (sonometrically according to age)	round	overlapping
TYPE IIa (minus) Physiologically immature→ < 12 weeks	insufficient α = 50 – 59° (lt. Sonometer too small, not according to age)	round	overlapping
TYPE IIb Delay of ossification > 12 weeks	insufficient α = 50 – 59°	round	overlapping
TYPE IIc Maturation at risk All ages	Highly insufficient α = 43 – 49°	From round to flat	Just overlapping β < 77°
TYPE D decentralisation All ages	Highly insufficient α = 43 – 49°	From round to flat	displaced β > 77°

Ill. 12 Description of hip types (Graf **[11]**)

3.4 Therapy

As mentioned before, treatment should begin as early as possible, due to the post-natal development process of the hip joint. In my opinion, this is also true for osteopathic treatment. The aim of the treatment is to centralise the head of the femur in the socket, in order to ensure correct development.

With decentralised hip joints, a repositioning of the head of the femur is absolutely essential before continuing into the retention phase. Here, most importantly, a re-luxation of the unstable head of the femur is to be avoided because, through arising compressive and shear forces, this may lead to further damage of the cartilaginous acetabular roof.

Centralisation of the femoral head should be achieved from an abduction /flexion position of the hip joint, as the head of the femur is pressed into the socket with increasing abduction and with increasing force.

For a developmental dysplasia of the hip up to type II c-stable, extra wide nappies or a hip brace is sufficient as the hip joint is stable. These interventions allow the infant to make kicking movements with the correct flexion and abduction positions.

Some orthopaedic specialists with whom I have spoken are of the opinion that this therapy for developmental dysplasia of the hip type IIa is not necessary, as there is a high tendency for spontaneous healing and the mother and child are unnecessarily burdened (Trobos, Schmidt, personal communication 2004).

Should treatment be proven necessary following the 6 weeks control sonography, their view is that a physiological development of the hip joint could be achieved without problems.

On one hand, this contradicts the reasons mentioned before about the importance of early diagnosis and treatment of a developmental dysplasia of the hip. On the other hand, I have come across many infants during my work whose control appointment was not kept. The reasons for this lie partly with the parents, but also through non-exact time scales (control in 6-8 weeks) and difficulty with finding a compatible appointment.

Developmental dysplasia of the hip with de-centring (type IId – IV), due to the unstable relationships, demands a resting position in abduction/flexion during the retention phase in which a shrinking process of the over-stretched capsule-ligament apparatus occurs. Various models from plastic orthoses or a “Sitz-Hock” plaster cast are being used for up to 4 weeks.

Constant observation is needed to avoid the danger of a possible head of femur necrosis through a forced abduction, and this has been stated many times by various authors. This poses a large treatment risk.[21]

Following retention phase, therapeutic intervention concludes with the application of an orthosis for subsequent maturation.

If all the above-mentioned interventions are unsuccessful, surgical intervention is possible, something which I feel does not require further detail.

[21] HEFTI, Kinderorthopädie in der Praxis **[15]**

Treatment Concept				
Phase	**Type**	**Treatment**	**Alternative**	**Notice**
1. Reposition (luxated joints)	III-IV Type D	Overhead Dfg. Sono Spontaneous Reposition	*Reposition Orthosis* Pavlik, Hanausek, Düsseldorfer, Fett-weis-splint etc. →	Compliance Parents ? Means of control ?
2. Retention (formally luxated, repositioned, instable joints)	All repositioned joints instable IIc (Exception: instable newly born. IIc)	„Sitz-Hock“ plaster cast (- 4 weeks)	*Reposition Orthosis* Pavlik, Hanausek, Düsseldorfer, Fett-weis-splint etc. →	
3. Subsequent maturation (stable "dysplastic" joints)	All repositioned joints	Graf-Mittelmeier-“Spreizhose” (~Frejka Pillow)	*Orthosis for subsequent maturation* splints, “Spreizhosen”, Pavlik, Bernau etc.	
	instable newborn IIc stable IIc IIa(-)/IIb	Graf-Mittelmeier	→ Fettweis, Hilgenreiner, „Optimalschale“, „Aktivspreizhose“ etc.	Try out 4 weeks ↓ stable – continue ↓ instable – ...Retention in „Sitz-Hock“ plaster cast

Ill. 13 Overview of the treatment phases and the possible therapeutic interventions (Graf **[11]**)

4. Epidemiology/Aetiology/Pathology

The so-called ‘luxation hip’ is the most common deformity of the musculo-skeletal system at birth and it is for this reason alone that it deserves special attention.

Searching for the causes, the “why and where from“, is not the theme of this dissertation but is naturally a fundamental part of our work as osteopaths.

It is partly this that motivates us, but it can also leave us doubting when important answers remain hidden.

In the next part of this presentation I will try to summarise the current scientific knowledge from the school of medicine, including some individual considerations of these points.

When one speaks with orthopaedic specialists and paediatricians about the aetiology and pathology of developmental dysplasia of the hip, the following points are commonly stated.

It is a well-researched area, in which extensive studies have been carried out and about which countless publications are available. This has predominantly been the case since hip sonography as a screening process has been carried out. Earlier investigations are to be read with caution, as the screening methods and interpretation of the assessments were very different. This may be valid for some statements in the following chapter on epidemiology.

Graf himself termed the existing literature on the subject as “fast nicht mehr übersehbar”. , which broadly means “immense in multitude” (Graf 2000).[22]

[22] GRAF R., Sonographie der Säuglingshüfte und therapeutische Konsequenzen, 5. Auflage, Thieme 2000 **[11]**

4.1 Epidemiology

Epidemiologically, great differences are present. The dyplasia rate in mid-Europe is 1-5%. However, in the USA, Great Britain and Scandinavia the rate is 0.5-1 %. Similar results can be found for the luxation rate ratio.

Hip joint luxation is barely known in African infants.

Infants of indigenous populations in Africa are carried by their mother sitting wide-legged on one side of the mother at the pelvis or on the back. This can be seen as prevention or, with existing developmental dysplasia of the hip, as therapy (refer to the chapter on therapy) in the phase of subsequent maturation.

In contrast to these figures, the rate of hip joint luxation in Lapland and in a certain number of North American Indian populations the rate is up to 5% higher. These people tend to wrap their infants quite tightly in nappies.[23]

Regional differences can also be found within individual countries.

For example, Sachsen, Oberpfalz und Oberhessen are particular luxation centres (Exner 1973).[24]

Generally there is a reduction of incidence which is, similar to other orthopaedic illnesses, connected to a genetic aetiological component and due to an increased mix within the genetic pool of the population.

The female : male ratio is to be found in the literature as 4 : 1 to 6:1 (Graf 2000).[25]

The left hip joint is more frequently (twice as much) affected than the right.

[23] HEFTI, Kinderorthopädie in der Praxis **[15]**
[24] EXNER, Spontanverlauf milder Hüftdysplasien **[17**]
[25] GRAF R., Sonographie der Säuglingshüfte und therapeutische Konsequenzen, 5. Auflage, Thieme 2000 **[11]**

4.2 Aetiology and Pathology

Influences from many different areas appear to be at the forefront of causes for developmental dysplasia of the hip/hip joint luxation.

It has been suggested that, due to the development of intelligence, the size of the human brain and skull has increased while the birth canal has become narrower, thus confronting man with a dilemma regarding reproduction. The solution is that infants are born physiologically underdeveloped (Hefti 1997).[26]

I cannot agree with this hypothesis as it would mean that, as well as the hip joint, other structures or organs would also be underdeveloped.

I have no knowledge of any literature that would confirm this type of development.

It would also mean that humans have made an evolutionary step that brings them into a possibly catastrophic dilemma if the process were to progress. In addition to that, investigations suggest that the incidence is in total decreasing (Hefti 1997).[26]

Alongside the afore-mentioned genetic factors, hormonal influences can be also cited as possible causes and they are said to play a role primarily in common joint hypermobility with accompanied instability of the hip joint.

Dunn[27] states the ratio of girls:boys as 12:1. However, he does not comment on whether this common hypermobility is accompanied by a maturation dysfunction of the acetabulum.

With healed hip dysplasia, deterioration during growth spurts in puberty is mentioned (Tucci 1991)[28], suggesting that there is a hormonal component.

Mechanical factors, such as a deficit in amniotic fluid and lack of space for the child, as in breech presentation, can be postulated as further causes.

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[26] HEFTI F., Kinderorthopädie in der Praxis, Springer 1997 **[15]**
[27] DUNN, Perinatal oberservations on the etiology of congenital dislocation of the hip **[18]**
[28] TUCCI, Late acetabular dysplasia following early successful Pavlik harness treatment of congenital dislocation of the hip **[19]**

This is supposed to lead to an ossification delay of the acetabular angle.

From this it can be derived that a lack of movement intra-uterine increases the risk of developmental dysplasia of the hip (Hefti 1997).[29]

In order to follow up this statement, I widened my questionnaire to include an additional point. Mothers were asked to provide information regarding the movements of their child intra-uterine i.e. if there was a lot of movement or it kicked a lot with its legs. This is obviously a subjective feeling, but I was astounded at how definite and clear the answers were.

A significant relationship between "not much movement" and an occurrence of hip dysplasia i.e. developmental dysplasia of the hip, could not be concluded here.

It is conspicuous that developmental dysplasia of the hip occurred frequently in combination with other orthopaedic abnormalities, such as clubfoot, facial asymmetry and muscular torticollis.

Thus, it would appear that developmental dysplasia of the hip occurs due to many different factors and, therefore, a holistic approach through osteopathic treatment is an absolute necessity.

The only safe parameter for the possible occurrence of developmental dysplasia of the hip is, in my opinion, the genetic predisposition. I have noticed that primarily bilateral delay of development of the acetabuli has been reported by the patients as having a high frequency within their families. An investigation of twenty patients is clearly too small to make this observation anything more than conspicuous. However, as I have not found any literature that addresses this subject, it may be beneficial with future, larger studies to include this question in their research.

[29] HEFTI F., Kinderorthopädie in der Praxis, Springer 1997 **[15]**

5 Methodology

5.1 Patient recruitment

One problem that I confronted at the beginning of my project was how to obtain the necessary number of patients (at least 15). The definition of the inclusion criteria (refer to chapter V.2) puts forward the most important criteria:

The journey time to therapy had to be acceptable to the parents.

Of the two regional hospitals who had labour wards, only one declared their support to my study.

I would therefore like to thank Consultant Dr. Claudia Haberland from the Kufstein hospital and her team, without whom, this study could have not taken place.

Most control sonographies are, however, not carried out in the hospitals but at private paediatrician or orthopaedic practices. Therefore, it was necessary to find a specialist for the recruitment of the control group who would offer to participate in the study. Dr. Stefan Trobos, orthopaedic specialist in Schwaz took on this task.

5.2 Treatment Group / Inclusion Criteria

Developmental dysplasia of the hip type IIa/IIb was an inclusion criteria, because Type IIc instable indicates retention treatment and higher degrees of hip luxation indicate reposition with following retention.

This demands a resting position in a pre-determined flexion/abduction position (refer to chapter 3.4) and is therefore not accessible therapeutically.

If corresponding results were found in the first sonography, carried out during hospitalisation, the parents received two information leaflets from the doctor. One contained general information about osteopathy with children and the second contained information about the aims of the study.

The doctor recommended thay they participate in the study.

Normally the appointment arrangements were made from the hospital or directly on discharge, in order to begin the therapy quickly.

Initially, all infants had to use extra wide nappies until the control sonography appointment took place 6 - 8 weeks later.

Additional therapy was not planned.

5.3 Control group

Most of the children for the control group came from the labour ward of the
A. ö. Schwaz Hospital where Dr. Stefan Trobos has his practice.

These infants also were diagnosed after sonographical first results with a developmental dysplasia of the hip types IIa/IIb. The parents were asked to use extra wide nappies with their children, at least up to the time of their control sonography, same as with the treatment group. On average, this was carried out in the seventh week following birth. An additional therapy did not follow.

Dr. Trobos agreed to fill in an initial questionnaire with 20 infants and pass this information on to me. This questionnaire was very simplified and information was limited to gender, genetic predisposition and results of the first and control sonography.

The design of this study is therefore equivalent to a clinical outcome study, match designed.

5.4 Treatment

At the beginning of therapy, the parents were reminded about the information leaflets they were given in the hospital and that the treatment would not be limited to the hip joint alone, but that a complete osteopathic assessment and treatment would take place. It was most important that the parents were informed that the infant, and not the study, was of primary importance to me and that my interest lay above all in prevention and treating dysfunction, in order to enable free development of the child to take place.

Subsequently, relevant data for the therapy and study was collected via questionnaire in order to make it easier to analyse and evaluate at a later stage. The results of the hip sonography were taken from the Mother and Child Pass.

In the sense of these guidelines, the therapy could neither be fixed to exact treatment techniques nor to exact intervals or numbers.

They were adapted individually and included the whole spectrum of osteopathic knowledge, understanding and skills that were available to me in the investigation, as well as in the therapy. The treatment ended when I felt that I had successfully treated all previous dysfunctions that could have been there before or after the control sonography and were also not dependent on the results of the control appointment.

From the total number of children, it was observed that on average 4 treatments in weekly intervals were necessary. With 3 infants in particular, an additional treatment session was carried out due to complaints of sleep disturbance or digestive problems which had not normalised, even though a normal result of the hip was found following their control sonography appointment.

6 Results

As shown in the graphics, the 20 infants in the treatment group, as well as those in the control group, demonstrated a normal result (Ia/Ib) at the control sonography.

From this point of view, the question raised by my dissertation " Is osteopathy an efficient form of treatment of developmental dysplasia of the hip type IIa/IIb, with regard to a quicker or better development of the hip joint?" has only one answer and that is 'no'.

Consequently this disease must be struck off the osteopathy treatment list, following similar conclusions from my German colleague's work, Fr. Weiss and also studies from very renowned orthopaedists point out, that this special kind of congenital hip dysplasia has a high potential to heal spontaneously (Katzmann, Bialik 2004). [30]

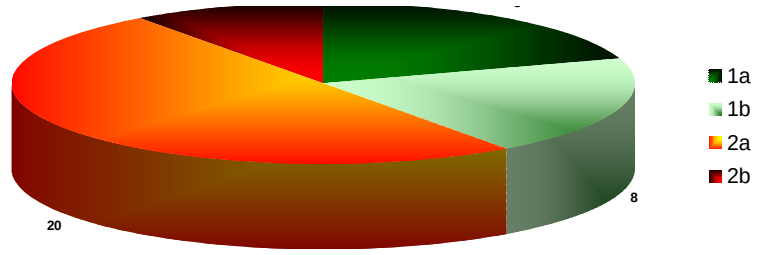
This is despite the infants that were investigated and treated by me showing additional dysfunctions and complaints (see chapter 7.2).

For prevention purposes, it would make sense to investigate and treat infants with a primary diagnosis of congenital hip dysplasia type IIa/IIb anyway.

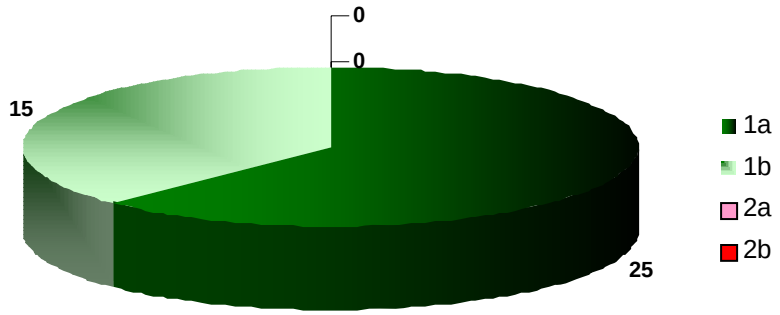
[30] KATHMAN, BIALIK, practical significance of sonographic type IIa of dysplastic hip joint according to Graf's classifications **[20]**

TREATMENT GROUP

1st sonography



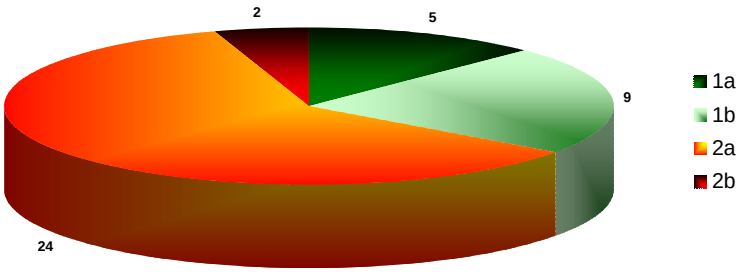
control sonography



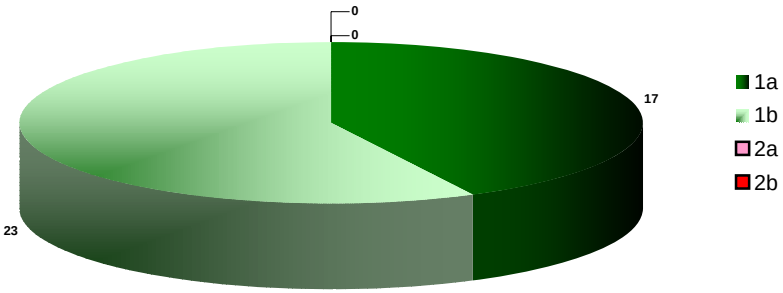
20 infants assessed and treated supplied me with the data for 40 hip joints. From the graphic above you will see that 24 hip joints still demonstrated pathological results at the sonographical initial assessment (IIa or IIb) whereas all hip joints showed normal results at the control sonography (Ia or Ib).

CONTROL GROUP

1st sonography



control sonography



Ill. 14: graphic evaluation of the test results

As with the treatment group, all assessed hip joints of the control group demonstrated normal results (Ia or Ib) at the control sonography.

6.1 Detailed analysis

Based on Graf's classification of developmental dysplasia of the hip according to their seriousness (see Ill. 12) I worked out an additional table of comparison. Within this table a clearly devided developmental dysplasia of the hip type Ia from type Ib. The criterion of this represented the angle beta which was defined to be smaller for type Ia than for Ib, resulting in the fact that Ia was to be considered "better".
This allowed me to express in clear figures the specific division of the types of developmental dysplasia of the hip and their changes in course of assessment resp. treatment of the treatment group and the control group and further on to calculate the percental difference.
The percental improvement of the treatment group was at 45,54 % versus 38,83 % of those of the control group.
This difference however is not significant in statistical terms as the number of infants should be multiplied in order to obtain utile results.

treatment group					control group				
1st sonography		control after x weeks	control sonography		1st sonography		control after x weeks	control sonography	
left	right		left	right	left	right		left	right
2b	2a	5	1a	1b	2a	1b	8	1b	1b
2a	2a	6	1a	1b	2b	2a	8	1b	1b
1a	2a	7	1a	1a	2a	2a	8	1a	1a
2a	1b	5	1b	1b	1b	2a	8	1b	1b
2a	1a	6	1a	1a	2a	1a	8	1b	1b
2a	1a	6	1a	1a	2a	2a	7	1a	1a
1b	2a	6	1b	1a	2a	2a	6	1a	1b
1a	2a	5	1a	1b	2a	1a	7	1b	1a
2a	2a	7	1b	1a	2a	1b	8	1a	1a
2a	1a	5	1b	1a	2a	2a	8	1b	1a
2a	1b	7	1a	1a	2a	1a	7	1a	1a
1a	2a	6	1a	1b	1b	2a	8	1a	1a
2a	1b	5	1a	1a	2a	1b	6	1b	1b
2b	2b	8	1b	1a	2b	1b	6	1b	1b
1b	2a	6	1a	1a	2a	1a	7	1a	1a
1a	2a	7	1a	1b	2a	1a	7	1a	1a
2b	1b	7	1b	1a	2a	2a	8	1b	1b
2a	1a	6	1a	1a	2a	1b	8	1b	1b
1a	2a	8	1a	1b	2a	1b	7	1b	1b
2a	2b	7	1b	1b	2a	1b	7	1b	1b

Ill. 15: table of the course of treatment

treatment group							control group						
1st sonography		control after x weeks	control sonography		difference		1st sonography		control after x weeks	control sonography		difference	
left	right		left	right	left	right	left	right		left	right	left	right
4	3	5	1	2	**3**	**1**	3	2	8	2	2	**1**	**0**
3	3	6	1	2	**2**	**1**	4	3	8	2	2	**2**	**1**
1	3	7	1	1	**0**	**2**	3	3	8	1	1	**2**	**2**
3	2	5	2	2	**1**	**0**	2	3	8	2	2	**0**	**1**
3	1	6	1	1	**2**	**0**	3	1	8	2	2	**1**	**-1**
3	1	6	1	1	**2**	**0**	3	3	7	1	1	**2**	**2**
2	3	6	2	1	**0**	**2**	3	3	6	1	2	**2**	**1**
1	3	5	1	2	**0**	**1**	3	1	7	2	1	**1**	**0**
3	3	7	2	1	**1**	**2**	3	2	8	1	1	**2**	**1**
3	1	5	2	1	**1**	**0**	3	3	8	2	1	**1**	**2**
3	2	7	1	1	**2**	**1**	3	1	7	1	1	**2**	**0**
1	3	6	1	2	**0**	**1**	2	3	8	1	1	**1**	**2**
3	2	5	1	1	**2**	**1**	3	2	6	2	2	**1**	**0**
4	4	8	2	1	**2**	**3**	4	2	6	2	2	**2**	**0**
2	3	6	1	1	**1**	**2**	3	1	7	1	1	**2**	**0**
1	3	7	1	2	**0**	**1**	3	1	7	1	1	**2**	**0**
4	2	7	2	1	**2**	**1**	3	3	8	2	2	**1**	**1**
3	1	6	1	1	**2**	**0**	3	2	8	2	2	**1**	**0**
1	3	8	1	2	**0**	**1**	3	2	7	2	2	**1**	**0**
3	4	7	2	2	**1**	**2**	3	2	7	2	2	**1**	**0**

Ia = 1, Ib = 2, IIa = 3, IIb = 4

Ill. 16: course of treatment – table of comparison

7 Discussion

7.1 Self critique

As I have already mentioned, this project is not without deficits that affect its quality and meaningfulness.

The first and the second investigators were not one and the same person and also the control sonography was not fixed to a standardised appointment time.
In addition to this, the internal validity of this study was cut down due to the fact that I treated on my own.

These problems led to not obtaining support for my work from a head of the labour and paediatric wards of a hospital, although the subject was of interest to him. He did not want to support a study that, due to deficits in the study design, would not be able to make a scientifically strong statement.

Osteopaths are confronted with such problems in their attempts to produce good dissertations. As a result of the infrastructure in many areas, it is practically impossible to fulfil the standards for a more highly qualified scientific study. A revision of osteopathic thought would be necessary in order to avoid disqualifying oneself.

7.2 General considerations of development dysplasia of the hip.

The most difficult areas of this dissertation for me were aetiology and pathology. Although there is a plethora of literature sources, these can only put forward presumptions of where the causes for congenital developmental dysplasia of the hip lie. The only real co-cause is, in my opinion, a genetic factor.

More questions are raised when comparing the risk factors, well published in medicine, such as insufficient amniotic fluid and the breech presentation, using information collected during my study.

Both the above-mentioned situations that occur in the uterus can limit movement possibilities of the hip and pelvis. This contradicts the statements of approximately 60 % of mothers questioned (most having had more than one child), that they experienced the movements of the foetus as strong and lively.

Non of the 20 investigated infants had suffered insufficient amniotic fluid in the womb (taken from the Mother/Child Pass) and only one presented breech at birth. All the others, with the exception of 2, were normal occipital presentation.

Although movement deficit, alongside mechanical factors, is one of the most mentioned co-causes of developmental dysplasia of the hip, it is not tenable.

The many unanswered questions in this area confirm my own feeling in this matter, that developmental dysplasia of the hip is multi-factoral.

All children in the treatment group demonstrated at least one other dysfunction as well as the hip dysfunction. So it was necessary to work with these infants cranio-sacrally and/or viscerally. Without exception, the infants had digestive complaints (flatulence/3-monthly

colic), sleep disturbance or crying attacks. Included were infants with torticollis or skull asymmetry.

In the treatment, it was not possible to find a common denominator, or as a colleague and good friend of mine put it, “Lege alle Befunde übereinander und versuche die Stellen zu finden, die sich decken, durch die du eine Nadel stecken kannst.” (*put all assessment results on top of each other and try to find a spot where they fit together, through which you could push a needle).* There was no definite agreement between the side of developmental dysplasia of the hip and the side of possible additional dysfunctions (visceral, craniosacral). Only the hip joint itself showed agreement in most of the subjects. On palpation, there was tissue tension detectable in the direction of decentring of the femoral head, and the coxal bone showed weak interosseus inpiration movement that mostly concerned the iliac bone. Improvement of these two parameters guided me in the judgement of whether the intervention was successsful.

At this point another issue arises. If the different orthoses for successive maturation could function in the way of a interosseus technique i.e.where the femoral head is centred in flexion/abduction position, forces are lead more axially into the hip joint and through this better self regulation is made possible for the body.

To me, the fundamental question in the development of hip maturation impairments is the time at which the normal maturation process is disturbed and which other embryological/foetal developmental processes take place at the same time. Regrettably, despite intensive research, it was not possible to find an answer.

The questions relating to aetiology and pathology or congenital developmental dysplasia of the hip remain unanswered.

7.3 Summary

Even though my work did not show the results that I had hoped and there are more questions now than before, it has been worth the effort in more ways than one. With all the infants, the complementary complaints and dysfunctions were successfully treated, something that was positive for all involved. The preventative aspect in the treatment of the infants could be implemented. Drawing up my diploma work ‘forced’ me to confront this subject intensively, something that I would normally never have done. This has given rise to many considerations which have had an effect on other areas of my work – a process that will continue for a while.

A new project for this specific subject would, in my opinion, only make sense if the external situation was better, if the study design was improved and it was carried out within a multi-disciplinary team.

Finally, I would once again like to thank everyone who supported me in this project work. I would especially like to thank my family, who have shown great patience and understanding during the years of osteopathy training. Also, many thanks go to my colleague and supervisor Norbert Rauter, who totally supported me with advice and constructive criticism and last but not least to my friend Elmar Schwarzenauer whose profound PC knowledge saved me from despair.

8 List of Illustrations

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Ill. 03: Articulatio coxae, Netter, Atlas der Anatomie des Menschen, 2. Auflage, Seite 454, Thieme 2000

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Ill. 06 : Muscular coaptative component, Klein, Biomechanik des Hüftgelenkes, Seite 21, 1994

Ill. 07: The direction of the resulting force, Klein, Biomechanik des Hüftgelenkes, Seite 15, 1994

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Ill. 09: Development curve, Z. Orthop 132, 1994

Ill. 10: line of the acetabular roof, cartilage line, base line, Graf, Sonographie der Säuglingshüfte, 5. Auflage, Thieme 2000

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10 Appendix

Physiotherapeutische Gemeinschaftspraxis

Osteopathie

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e-mail: rautell.osteopathie@utanet.at

Dear Parents!

Following an ultra-sound investigation your child has been shown to display a hip dysplasia type 2a or 2b and it is recommended by the medical team that your child wear extra wide nappies in order to assist the correct development of the hip joint.

In approximately 6 weeks there is a control appointment to ascertain if this treatment has been successful, or if further treatment is necessary.

Osteopathy, with its specific techniques believes that it can assist in the actual development and accelerate the development of the hip joint. In order to scientifically investigate this "belief" I am carrying out a study.

If you are willing for your child to take advantage of this additional treatment, which works exclusively with very gentle, regulating techniques, you can do so free of charge. However, the treatment must begin immediately, in order that results are of some use by the second check-up.

Your doctor will provide you with brief information about the use of osteopathy with children, so that you can obtain an initial impression of the treatment methods.

Osteopathy with Children

The therapist tries to bring the correct information into the patients' system at the right time, in order to initiate the healing process.

The therapist does not heal, but rather the body heals itself – in this way osteopathy is an auto regulative form of treatment.

The localizations to which osteopathic information is brought are mostly areas of limited movement (visceral, structural or craniosacral) and where it is not possible for the body itself to release the increased tension.

Even with children, lesions can lie at a structural, visceral or craniosacral level.

They are mostly found in the craniosacral system.

Causes: - Problems in pregnancy, such as diabetes, gestoses, traumas (emotional or somatic)
- Problems at birth: position, a lengthy expulsion phase, strangulation by the umbilical cord, hip dysplasia, etc.
- postnatal psycho-emotional or somatic trauma or diseases

In the sense of an early prevention, we would recommend osteopathic investigation and treatment as soon after birth as possible with the above-mentioned problems.

The limits of osteopathic treatment are pre-determined through the structural damage of a tissue.

Despite this, it is expected that, in most cases, a clear improvement of the symptoms will be obtained if success is found in freeing the mobility of all surrounding structures to activate the adaptative ability of the body to improve conditions of the impaired tissues.

- Indications: 3-months colic, torticollis, sucking, swallowing and breastfeeding problems reoccurring mid-ear inflammation and angina, neurodermitis, sleep disturbances, headaches, hip dysplasia, spinal problems, behavioural disturbances, partial impairment, perceptual disturbances, coordination problems, fine motor problems, etc

Naturally a medical check-up with the doctor is necessary before an osteopathic treatment can take place, in order to exclude any serious diseases.

The aim of treatment is to achieve a re-harmonising and subsequent auto-regulation of the body.

QUESTIONNAIRE ON CONGENITAL HIP DYSPLASIA

o male o female

fam. predisposition: o yes o no

intra-uterine movements: o strong o weak

Result 1. sonography: le. hip:

ri. hip:

Pregnancy:

Birth:

Complaints/Infants condition:

Result/osteopathic treatment:

Result of control sonography: le. hip:

After ___ weeks ri. hip:

AUSWERTUNG

Behandlungsgruppe

Pat. Nr.	1. Sonogr. Hüfte		Kontr. nach x Wochen	Kontr.Sonogr.	
	links	rechts		links	rechts
1	IIb	IIa	5	Ia	Ib
2	IIa	IIa	6	Ia	Ib
3	Ia	IIa	7	Ia	Ia
4	IIa	Ib	5	Ib	Ib
5	IIa	Ia	6	Ia	Ia
6	IIa	Ia	6	Ia	Ia
7	Ib	IIa	6	Ib	Ia
8	Ia	IIa	5	Ia	Ib
9	IIa	IIa	7	Ib	Ia
10	IIa	Ia	5	Ib	Ia
11	IIa	Ib	7	Ia	Ia
12	Ia	IIa	6	Ia	Ib
13	IIa	Ib	5	Ia	Ia
14	IIb	IIb	8	Ib	Ia
15	Ib	IIa	6	Ia	Ia
16	Ia	IIa	7	Ia	Ib
17	IIb	Ib	7	Ib	Ia
18	IIa	Ia	6	Ia	Ia
19	Ia	IIa	8	Ia	Ib
20	IIa	IIb	7	Ib	Ib

Kontrollgruppe

Pat. Nr.	1. Sonogr. Hüfte		Kontr. Nach x Wochen	Kontr. Sonogr.	
	links	rechts		links	rechts
1	IIa	Ib	8	Ib	Ib
2	IIb	IIa	8	Ib	Ib
3	IIa	IIa	8	Ia	Ia
4	Ib	IIa	8	Ib	Ib
5	IIa	Ia	8	Ib	Ib
6	IIa	IIa	7	Ia	Ia
7	IIa	IIa	6	Ia	Ib
8	IIa	Ia	7	Ib	Ia
9	IIa	Ib	8	Ia	Ia
10	IIa	IIa	8	Ib	Ia
11	IIa	Ia	7	Ia	Ia
12	Ib	IIa	8	Ia	Ia
13	IIa	Ib	6	Ib	Ib
14	IIa	Ib	6	Ib	Ib
15	IIa	Ia	7	Ia	Ia
16	IIa	Ia	7	Ia	Ia
17	IIa	IIa	8	Ib	Ib
18	IIa	Ib	8	Ib	Ib
19	IIa	Ib	7	Ib	Ib
20	IIa	Ib	7	Ib	Ib

Abstract

Congenital Developmental Dysplasia of the Hip (Type IIa/IIb)
Is Osteopathy an efficient form of treatment?

Key words: congenital developmental dysplasia of the hip Type IIa/IIb, aetiology and pathology, sonography, osteopathy, holistic treatment

Aim of the study: This study should demonstrate if there is quicker and qualitatively better development of the hip socket joint in infants who have been treated osteopathically than those treated in a control group.

Patients: 20 infants in the treatment group and 20 in the control group, all with a Type IIa/IIb sonographical initial assessment of the hip joint. The infants in both groups wore extra wide nappies up until their control appointment at approximately 7 weeks. The infants in the treatment group were assessed and treated using an holistic osteopathic approach.

Results: At the time of the control appointment, the hip joints in both groups demonstrated 100% normal results (Ia/Ib).
Neither in terms of time nor quality, could a difference in the development of the hip socket be found.

Summary: The chosen developmental dysplasia of the hip (types IIa/IIb) has a high potential to heal spontaneously.

Both groups of 20 infants are too small to obtain a statistically useful result. In my opinion a further study, using a multi-disciplinary approach (orthopaedics, physiology, embryology, osteopathy) using larger patient numbers and stricter inclusion criteria (e.g., type IIc stable), with subjects not wearing wide nappies, ensuring exact control appointments and having the same sonographic tester, would make sense. It would be most interesting to research the pathology in greater detail, in order to gain a better understanding of the origin and treatment of developmental dysplasia of the hip.