Osteopathic Preparation for Birth

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Master of Science in Osteopathie

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ABSTRACT

Osteopathic Preparation for Birth

by Maria Reiter-Horngacher

The duration of birth of 20 primiparous women treated with osteopathic methods and 20 women without preparation according to osteopathic methods were compared by means of an questionnaire. Between the 32. and the 38. week of pregnancy, the women of the test group were treated according my hypothesis, that an osteopathic preparation focused on the correction of bony malpositions of the pelvis, the extension of the M. piriformis and the M. iliopsoas, the resolution of tensions in the area of the pelvic floor and the correction of the SSB and the os sacrum leads to a shortening of the duration of birth. Additionally, all malpositions which have been found in the course of the examination have been corrected.

It could be shown, that women who were treated according to osteopathic methods took about 1.5 hours less for birth than the women in the control group. For the women of the control group labour lasted 5 hours on average. For the women who had received osteopathic preparation this period of time was 3.5 hours on average. The start of birth was defined by those labour pains, which occurred in maximal intervals of 5 minutes with a minimum duration of one minute.

PREFACE

This paper is the conclusion of my 6-year osteopathic training. I have chosen the topic preparation for birth because I have worked with many pregnant patients before. Since my first child was born I know how painful it is when birth lasts too long.

For me this paper is an important starting point for the future treatment of pregnant women.

It was a challenge for me to acquire expertise in this area and to gain an additional qualification. The task of bringing this paper to an end according to all formal rules not only required an intense treatment of the topic, it also was a personal challenge.

The following persons supported me during my work on this paper:

Ms. Hannike Nusselin who always looked after me very friendly during the entire work on this paper.

My husband Hannes helped me with important advice and kept on motivating me to proceed in this work and to finish this paper.

My mother Maria and my mother-in-law Kathi helped me with their babysitting services to write this paper.

Without the certainty that my son Julian is well looked after by his childminder Ms. Jutta Sporrer I would not have been able to work calmly and concentrated in my surgery.

Mr. Filipp Gernot helped me with the statistics.

Ms. Eva Jansenberger translated this paper into English.

Ms. Anja Groll volunteered as a model for the photographs.

I thank you all sincerely!

I dedicate this paper to my family.

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1. HYPOTHESIS

When I worked out my concept for this study in 2000, I put up the hypothesis, that an osteopathic preparation of pregnant women focused on the following **four main areas** leads to a shortening of the birth:

- CORRECTION OF BONY MALPOSITIONS OF THE PELVIS
- EXTENSION OF THE M. PIRIFORMIS AND THE M. ILLIOPSOAS
- RESOLUTION OF TENSIONS IN THE AREA OF THE PELVIC FLOOR
- CORRECTION OF THE SSB AND THE SACRUM

In the next subchapters I will describe my fundamental considerations for this hypothesis.

1.1. CORRECTION OF BONY MALPOSITIONS OF THE PELVIS

In the first stage of birth the pelvis has to widen in the pelvic inlet to allow the entering of the child. During the second stage of birth a reverse process takes place and the pelvic outlet has to open. For this reason the correct position and the mobility of the bones of the pelvis is of great importance.

1.2. EXTENSION OF THE M. PIRIFORMIS AND THE M. ILLIOPSOAS

The M. psoas is a posterior and inferior support for the uterus. The conjunct base forms a connection to the diaphragm.
During birth, when the child enters the small pelvis, the M. piriformis and the M. opturatorius internus are the first muscles the child's face has contact with.
Having the same base at the sacrum as the lig. uterosacrale, the M. piriformis is connected to the cervix and therefore is important for the opening of the uterine orifice.

1.3. RESOLUTION OF TENSIONS IN THE AREA OF THE PELVIC FLOOR

The muscles in the pelvic floor area normally cling to the pelvic floor. During birth they come out and form the birth canal. The entire pelvic floor must be able to expand and has to be of soft quality, the individual layers must be palpable.

1.4. CORRECTION OF THE SSB AND THE SACRUM

The pituitary gland is dependent on the rhythmic motions of the sphenoid. In case of a dysfunction of the sphenoid the function of the pituitary gland is restricted as well. The dura mater connects the sacrum to the sphenoid. Therefore dysfunctions can be transmitted from the sacrum to the sphenoid and the other way round.

Moreover I treat all other malpositions of the musculoskeletal system which I have found in the course of the diagnosis according to osteopathic principles.

2. ANATOMY

In this chapter I will summarise the anatomical basis for my hypothesis introduced above.

2.1. THE BONY FRAME OF THE PELVIS

2.1.1. The Static Function

The bony frame of the pelvis is formed of the ilium, the sacrum and coccygis and the two ossa coxae.

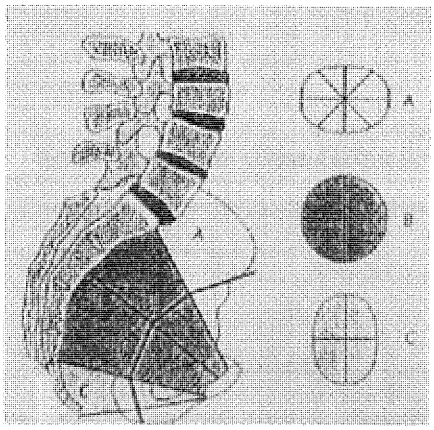

Fig. 1: Small pelvis

In Figure 1 three areas in the small pelvis can be distinguished:

A. The transverse oval-shaped pelvic inlet
B. The round pelvic centre
C. The longitudinal oval-shaped pelvic outlet

Kapandjii elabourates on the difference between the female and the male pelvis in greater detail (Kapandjii, I.A., 1985, 46). These morphologic characterisations are due to pregnancy and birth. Therefore the female pelvic inlet is wider and shallower and its oval shape is nearly transverse.

Waldeyer and Platzer describe differences in the Os Sacrum (Waldeyer A. and A. Mayet, A., 1986 and Platzer, W., 1986, 48). According to them, the female sacrum is shorter, wider and less curved to facilitate birth. Also describes the male sacrum as long, and

Symonds describes the different shapes of the female sacrum (Symonds, E. M. and Symonds, I. M., 1998). According to his research a concave and mobile sacrum is better suited for birth than a flat and immobile sacrum.

The dimensions of the pelvis are described by the diameters shown in Fig. 2., more accurate descriptions and their typical measures are presented in the following subchapters.

2.1.1.1 The Diameters in the Pelvic Inlet

The Conjugate Vera Obstetrica:
The conjunction between the promotorium and the back area of the symphysis measures 11 cm.

The Diameter Obliqua I:
The left oblique diameter runs from the left eminentia iliopubica to the opposite articulatio sacroiliaca and measures 12 cm.

The Diameter Obliqua II:
The right oblique diameter runs from the right eminentia iliopubica to the opposite articulatio sacroiliaca and measures 12 cm.
In case of a left head presentation the head twists through the first oblique diameter, in case of a right anterior head presentation the head twists through the second oblique diameter.

The Diameter Transversa:
The largest diameter of the ellipsis measures about 13 cm.

2.1.1.2 The Diameters in the Centre of the Pelvis:

The diameter in the centre measures about 12 cm.

2.1.1.3 The Diameters of the Pelvic Outlet

The Direct Diameter:

The conjunction between the lower rim of the symphysis and the apex of the sacrum measures about 9 cm.

The Transverse Diameter:

The conjunction between the two tuber ossis ischii measures about 11 cm.

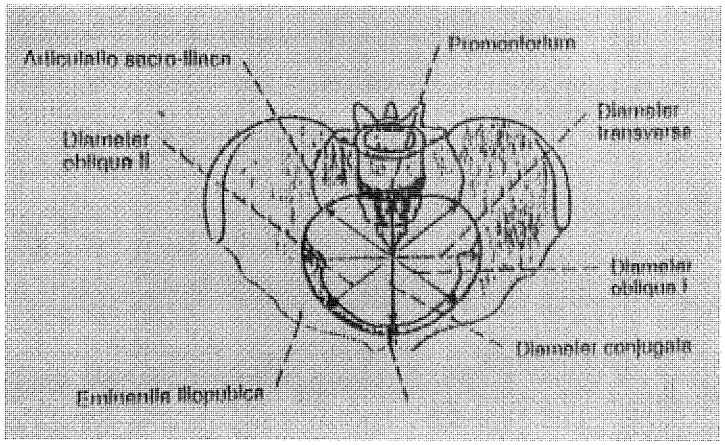

Fig. 2: Diameters of the pelvic inlet.

It follows that:

The girth of the head is larger than the axis of the pelvis. It is important for birth that the head stays on a transverse axis to the pelvis at the beginning.
As soon as the head has entered a little bit a turn happens.

There are two possibilities to use the diagonal axis:

- In 60% of cases the child's occiput comes in contact with the mother's left ilium, the baby only has to perform a 30° turn to get on. Conditional on the flexion of the child's head when the weight is under the promotorium, a 30° turn takes place. The child's nose follows the sacrum in order to pass the coccygis. The pressure on the coccygis is what widens the pelvic floor.

- In 34% of cases the child's occiput makes contact with the mother's right ilium. During birth a child always turns clockwise, therefore the baby has to perform a 160°-180° turn i.e. this turn takes much longer.

The reason for the clockwise turn of the child is the helical arrangement of the muscles on the inside of the uterus (cf. Fig. 3).

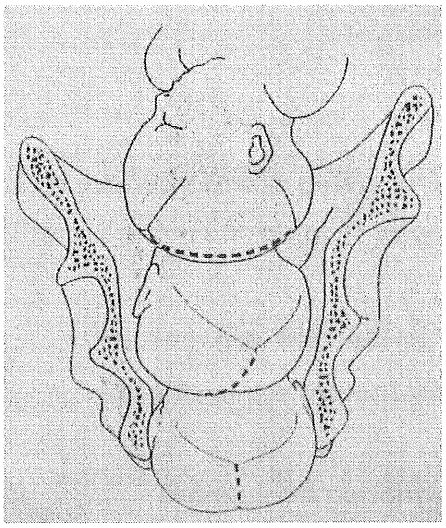

Fig. 3: Turn of the child's head during birth.

In 6% of cases it is a different oblique axis, 2% of which are a breech presentation.

There are two possible kinds of breech presentation:

- The face is anterior: The delivery involves the risk that the child's chin gets caught on the pubis which involves a high risk because that way the birth is stopped.
- The face is posterior: In this position birth can take place without major complications even in case of a breech presentation.

2.1.2. The Dynamic Function

The pelvis has not only a static, but also a dynamic function. This and the mobility of its attached structures will be discussed in this chapter, since the focus on the correction of bony malpositions of the pelvis is one of the main areas of my osteopathic preparation.

2.1.2.1 The Mobility of the Pelvis during Parturition

The mobility in the pelvis area is an important prerequisite for delivery.
From a mechanic point of view there are two stages:

- **During the first stage of birth the pelvis has to widen in the pelvic inlet to allow the entrance of the child.**

  The sacrum performs a conternutation,
  the lumbal spine performs a delordosis
  the ileas perform an outflair
  the upper part of the pubis has to open.

- **During the second stage of birth a reversal takes place, the pelvis has to open in the pelvic outlet (cf. Fig. 4).**

  The sacrum goes into nutation
  the ileas close on top an open at the bottom, making an inflair
  the lower part of the pubis has to open
  the coccygis has to allow an extension.

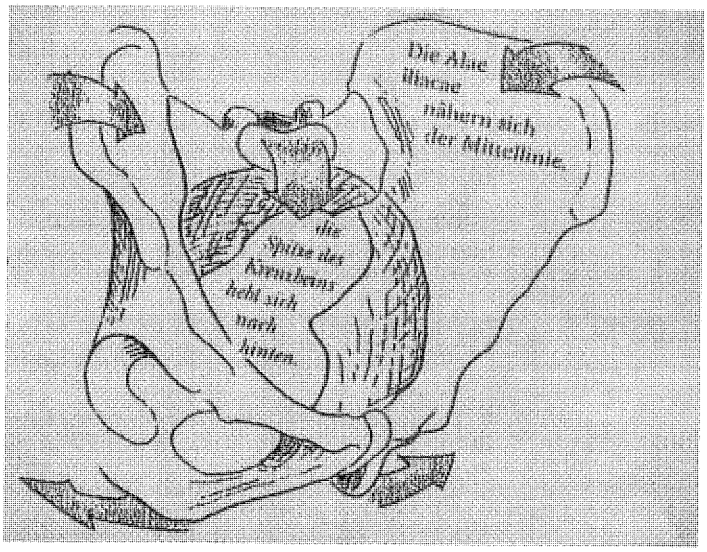

Figure 4: Opening of the pelvic outlet and inflair of the ileas.

2.1.2.2 Motions of the Pelvis as a Consequence of Motions in the Trunk or the Hip

When sitting down an inflair movement takes place on both sides.
The sacrum performs a motion of nutation. In the two rami superiores ossis pubis a movement to inferior and lateral takes place.
The two tuber move up to 15-20 mm apart. As a result a maximal opening of the lower pelvis and an extension of the ligg. sacro-tuberalia, the ligg. sacro-spinalia and the perineum take place.

According to Kapandjii (Kapandjii, I.A., 1985, 62) a shift in position of the promotorium by 5.6 mm takes place between the motion of extension and flexion in the hip joint.

For this reason a sitting position is best suited during the second stage of birth.

2.1.2.3 The Sacro-Coccygeal Joint

In the subsequent chapters 2.1.2.3 – 2.1.2.6 I refer to Peeters, L. and Lason, G., 1993).

The sacro-coccygeal joint is the smallest joint in the pelvis area.
Many soft parts of the small pelvis are attached to the coccygis.
According to Barral (Barral, J.-P. and Mercier, P., 2002, 318) the pressure of the child's head and the relaxation of the M. levator ani lead to a flexion of the coccygis to posterior.
According to Kapandjii (Kapandjii, I.A., 1985, 60) a passive movement of extension and flexion cannot take place but during an evacuation of the bowles and during delivery. The extension of the coccygis leads to an enlargement of the pelvic outlet during the second stage of birth.

2.1.2.4 The Ilio-Sacral Mobility

During the rotation around the dorso-ventral axis the ilium can perform an inflair as well as an outflair.
This movement is important for birth, because the inflair movement leads to an opening of the pelvic outlet while the outflair movement leads to an opening of the pelvic inlet.

2.1.2.5 The Sacro-Iliacal Mobility

The rotation around the middle transversal axis enables the motions of nutation and conternutation of the sacrum.
This movement is important for birth because the nutation leads to an opening of the pelvic outlet while the conternutation leads to an opening of the pelvic inlet.
According to Still, the os sacrum has to be positioned at least 5 cm apart from the os pelvis in order to provide enough space for the child's head. (Still, A.T., 2002).

2.1.2.6 The Symphysis Pubica

The pubis forms the axis for birth. The child rotates in a sagital level around the pubis.

Due to a hormonal change in the course of pregnancy the symphysis pubica loosens up and thus allows a slight shearing and lateral motion.
The point of contact for the child's head is located on the superior area of the symphysis.

According to Symonds (Symonds, E. M. and Symonds, I. M., 1998, 358) the pressure of the child's head exercises on the pelvic ring leads to a separation of 1 cm. This even can cause the ligaments of the symphysis pubica to tear apart.
The pubis has to open in the upper part during the first stage of birth and in the lower part during the second stage of birth.

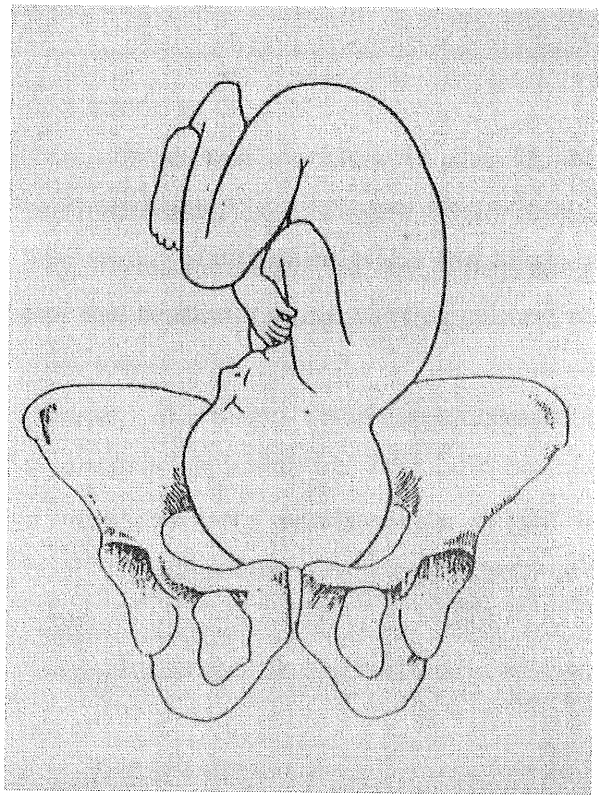

Fig. 5: Position of the child during the first stage of birth.

Taking all this into consideration, the correct position and the mobility of the bones of the pelvis are of great importance for a short birth. Therefore, the correction of bony malpositions of the pelvis and of attached structures is one of the main areas I concentrate on.

2.2. THE PELVIC DIAPHRAGM – THE PERINEUM

The pelvic diaphragm is formed of bony and ligamental parts and it's functionality is concerned with mobility and stability during walking and standing.
Moreover there is the perineum which provides the imperviousness and the permeability of the forces of the functioning of the organs.
Together they absorb the intra-abdominal pressure, protect the organs in the pelvis area and transform the forces of gravity.

2.2.1. The Perineum

The perineum (cf. Fig. 6) is the totality of the soft parts which form the inferior and lateral ending of the pelvis.
The lateral wall consists of the M. obturatorius, the M. piriformis and their aponeurosisis.
The musculus piriformis and the ligamentum uterosacrale have the same base. For this reason a muscular dysbalance can influence the uterus.
The lower wall consists of the m. levator ani, m. coccygeus, m. transversus perinei, m. bulbo- and ischiocavernosus, the m. sphinkter ani and their aponeurosisis which form the birth canal.
It must be very elastic since it has to resist strong persisting pressures of coughing, sneezing, pressing or the pressure during pregnancy.

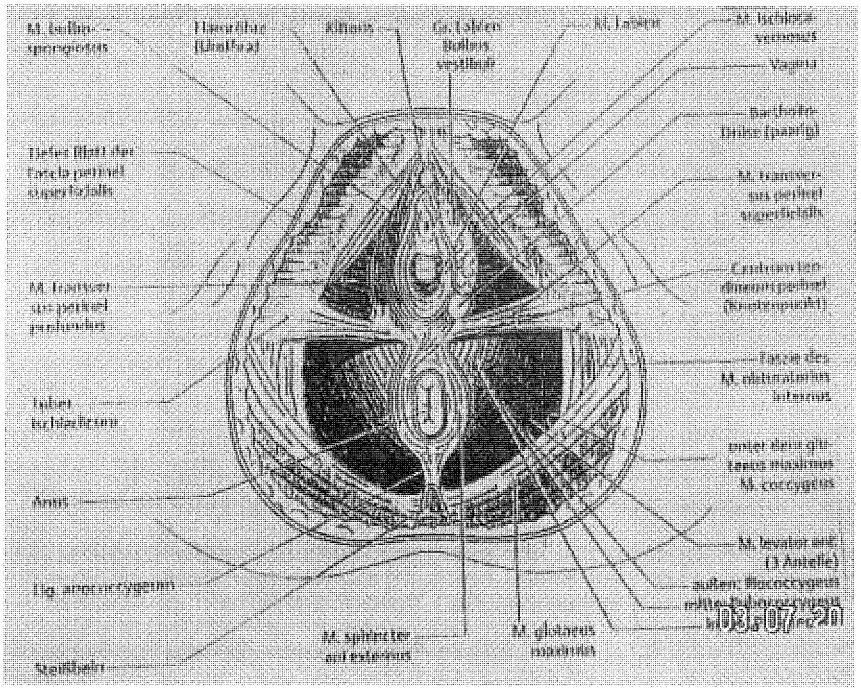

Fig. 6: Soft parts of the perineum.

2.2.2. The Pelvic Floor

Also the pelvic floor is one of the main areas where I put my focus on during therapy. According to Molinari (Molinari, R., 2001) 50% of episiotomies are due to the fact that this part is not relaxed.

The pelvic floor consists of three layers:

- The M. levator ani is the deep layer and forms the **pelvic diaphragm**.
- The mm. transversus perinei profundus and superficialis are the middle layer and form the **urogenital diaphragm**.
- The mm. sphinkter form the **superficial layer**.

The rear part of the pelvic floor forms the last barrier. The pelvic floor is composed of layers. Muscles, glands and connective tissue are located between the individual layers. Scars, ruptures and emotional tensions often lead to tensions in this area.

According to Leonhardt the pelvic floor is widened passively during pregnancy (Leonhardt, H., 1991, 328).
A downward turn of the lamina of the levator of about 90° takes place. The m. transversus perinei profundus is transformed at the same time.
The mm. bulbospongiosi, which are in a sagital position, widen to form a ring. That way the birth canal is formed.

2.2.3. The Innervation and Vacularisation

The nerval supply is granted by the plexus sacralis which runs between the M. piriformis and the M. coccygeus.
A tension in the M. piriformis can influence the plexus sacralis, which can result in a labour weakness during delivery.
When a pregnant woman has a twisting running movement and moves the whole upper part of the body when she walks this can result in a fibrosis of the M. piriformis. Thus, the cervix is pulled backward which can lead to an irritation of the plexus hypogatricus.

The elasticity of the perineum and the relaxation of the pelvic floor are of great importance for a short birth. Tensions can cause labour weakness or be the reason for perineal injuries during delivery. Therefore, the resolution of tensions in the area of the pelvic floor is one of the main areas I concentrate on.

2.3. THE UTERUS

2.3.1. Shape and Position of the Uterus

The organs of the pelvis are located under the viscera and fill the small pelvis. The upper part of the small pelvis is bent forward and the viscera are shaped like a dome that is bent upwards.
The uterus is the organ of pregnancy and consists of smooth muscles. The cave is covered with mucous membrane which is subject to cyclic changes and functional modifications during pregnancy.

The uterus is located under the peritoneum.
It is situated under and above the bladder, in front of the rectum and above the vagina.
The uterus is very mobile and most of the time it is in anteflexo and anteversio.
It consists of the corpus with the fundus (cf. Fig. 7), the hypothetic projection of which is 2-3 cm above the rim of the symphysis. This depends on the degree of the filling of the bladder, the position of the cycle and the shape.
(Compare also with Rohen, 1998, 336, where the size of the fundus uteri is depicted).

Another part is the isthmus, here the fallopian tube enters the uterus and the cervix is at the same level as the articular cavity of the art. sacrococcygea.
This shows that the uterus has a connection from the bony position of the pelvis as well.

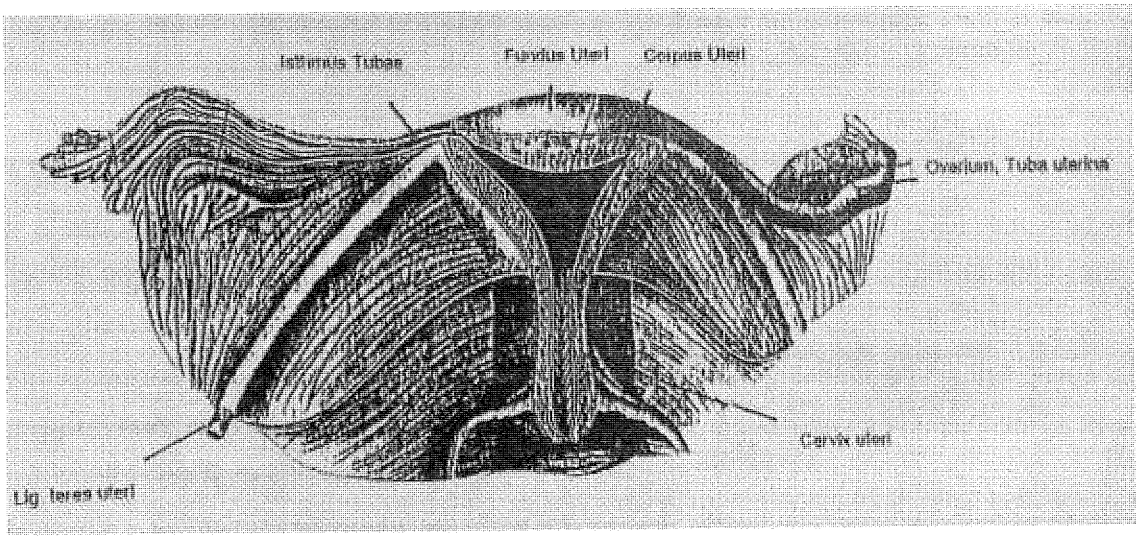

Fig. 7: Structures of the uterus.

2.3.1.1 The M. Psoas as the Rear Supporting Function of the Uterus

The psoas muscles are also one of the main areas where I put my focus on during therapy. Is one of the two psoas hyperton a shift of the uterus takes place (cf. Fig. 8).

The psoas can be seen as two rails. From a certain size on the child cannot stay between the rails anymore.
When the child weights more than 2,5 kg it must turn its shoulders slip in on one side of the psoas. This is difficult for a small child since it can get stuck between the ileas.
A taller child can push itself through with its shoulders and elbows. The resistance of the m. psoas is the fulcrum the baby needs.

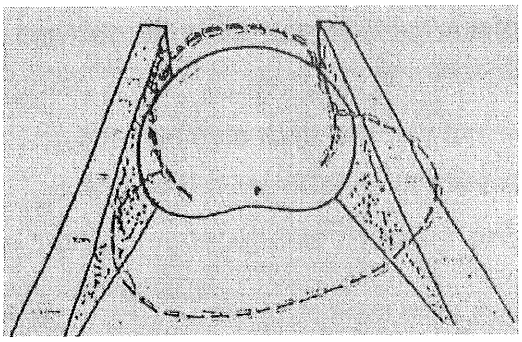

Fig. 8: Shift of the uterus due to hypertension of one psoas muscle.

2.3.1.2 The Position of the Uterus

Hardly any woman has a balanced uterus. Sidebending and rotation at the same time are common and widespread.
But when the rotation takes place at the opposite of the sidebending the head is compressed. In connection with a tension in the M. psoas or the M. piriformis this can lead to complications during birth.
According to Barral the malposition of the uterus is not the most important factor (Barral, J.-P., 1993, 129). It is of great importance whether the uterus has mobility and motility or not.
A locally fixated uterus makes a fibrosis around the restriction and this leads to a reduction in the local blood flow. It has not been proven yet whether this leads to foetal injuries or not.
The uterus must stay mobile in order to perform all functions.
The uterus is subject to the movements of the diaphragm to a high degree.
During inspiration the uterus moves to caudal/ventral, during the expiration the uterus moves to dorsal/cranial.

Barral describes the mobility and the shifts in position to a high degree with reference to the surrounding organs (Barral, J.-P. and Mercier, P., 2002, 297)

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2.3.2. Ligamental Articulations of the Uterus

2.3.2.1 The Ligamentum Rotundum

It runs from the upper rim of the uterus to the pubis. A tension over the piriformis can therefore be transferred via the lig uterosacrale and the lig. teres to the pubis.
The lig. inguinale runs laterally from the pubis to the spina iliaca anterior superior.
This shows the importance of the bony position of the pelvis.
During pregnancy this ligament becomes nearly vertical and reaches four times its normal size.
This results in a pull in the ligamentum rotundum. For this reason women sometimes feel a twinge at the upper rim of thy symphysis.
In case of a fibrosis of the ligament the pain is located under the inner front edge of the os pubis. This can lead to a reduction in contractions during birth.
According to Symonds these ligaments can tear apart as a result of needless manoevres during delivery or when the aid for delivery is not coordinated with the bearing-down pains. In this case they are replaced by useless tissue. This of course is no ideal prerequisite for further births (Symonds, E. M. and Symonds, I. M., 1998, 141).

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2.3.2.2 The Ligamentum Uterosacrale

It has the same base on the facies pelvina of the sacrum as the M. piriformis. Every tension in this ligament can result in a transformation in the cervix via the musculus piriformis.

2.3.2.3 The Ligamentum Latum

It is a lamina consisting of connective tissue in a frontal position and runs from the lateral wall of the uterus to the lateral wall of the pelvis and is covered by the

peritoneum. The cranial part encloses the fallopian tube. On the dorsal side the ovary is enclosed in a secondary fold. From the ovary another fold leads from to the upper wall of the pelvis and comprises the artery and the vein ovarica.
Its connective tissue is folded like an accordion and unfolds when the uterus grows. This tissue is prone to adhesions after inflammations and pains in the groin during pregnancy are connected to that.

2.3.3. Changes in the Uterus During Pregnancy

2.3.3.1 Changes of the Corpus Uteri

The subsequent descriptions are taken from Bickenbach, 1968.

Normally the uterus is located at the level of the upper edge of the symphysis.
During pregnancy it moves up to the diaphragm and a change in size, position and shape takes place.
In addition, an increase in weight from 50 grammes in non-pregnant condition to up to 1100 grammes before birth takes place in the uterus.
Furthermore, a hypertrophy of the blood vessels takes place and the blood supply increases from 50 ml/min in the tenth week to 500 – 700 ml/min at the time of birth.
The uterine contractions are measurable from the seventh week on.
The contractions can occur every 20 – 30 minutes but they only reach a pressure of less than 10 mm Hg.
During the last third of pregnancy the contractions can occur every 10 – 15 minutes with a pressure of 20 – 40 mm Hg. Those contractions are known as Braxton-Hicks contractions.
During birth the contractions become more painful and during the last part of the first stage of birth they reach a pressure of up to 200 mm Hg.

2.3.3.2 Changes of the Cervix

During pregnancy a decrease in collagen takes place, which allows the dilation of the cervix.

According to Symonds (Symonds, E. M. and Symonds, I. M., 1998, 21) the corpus luteum produces relaxin during pregnancy, the level of which increases in the first trimester and goes back to a level which is kept until birth in the second trimester.

Relaxin aims at the cervix, the uterus and the ligaments of the pelvis.

It supports the relaxation of the joints in the pelvis to prepare it for the passage of the foetus during birth.

I also put my focus on the psoas muscles and the m. piriformis during therapy.

Is one of the two psoas hyperton a shift of the uterus takes place. When a rotation of the uterus takes place at the opposite of a sidebending the child's head is compressed. In connection with a tension in the M. psoas or the M. piriformis this can lead to complications during birth. According to Barral a locally fixated uterus makes a fibrosis around the restriction and this leads to a reduction in the local blood flow.

In case of a fibrosis of the lig. rotundum the pain is located under the inner front edge of the os pubis. This can lead to a reduction in contractions during birth. Every tension in the lig. uterosacrale can result in a transformation in the cervix via the musculus piriformis influencing the opening of the uterine orifice

3. CRANIAL ANATOMY

3.1. GENERAL CRANIOSACRAL ANATOMY

In order to make this paper readable for non-osteopaths as well I want to begin this chapter with a short general explanation of craniosacral anatomy.
The craniosacral rhythm as such is a rhythm of the body.
It allows a gentle motion of flexion and extension of the cranial bone as well as of the entire body. According to Sutherland these motions take place at a frequency of 6 to 14 times per minute.
Rollin E. Becker found a rhythm of 6 cycles in 10 minutes.
Jim Jealous found a rhythm of 2,5 cycles per minute.
There are some more different rhythms of different frequency.
For further information it may be referred to van Assche (Roissaint, A.; Lechner, J. and van Assche, R., 1991, 35) who describes how Sutherland proved, based on experiments, that a rhythmic motion in the cranial sutures is possible and to Upledger where Philipp E. Greenman reports on the x-ray results of the craniosacral mechanic (Upledger, J. E. and Vredevoogd, J.D., 1991, 329).

3.1.1. The Primary Respiratory Mechanism (PRM)

Sutherland calls the craniosacral motion the "Breath of Life", the primary respiratory mechanism, for these motions lead to a rhythmic drainage of every cell in the body.

The prime respiratory mechanism is composed of following motions:

1. The inherent motion of the brain and the spinal chord.
2. The inherent fluctuation of the liquor cerebro spinalis.
3. The mobility of the intracranial and the intraspinal membranes.
4. The mobility of the cranial bones.
5. The automatic motion of the Os sacrum between the two ossa ilii.

These motions are described more accurately in Greenman, P.E., 1998.

3.1.2. The Spheno-Basiliar Synchrondrosis

The centre of mobility of the cranial bones is the spheno-basiliar synchondrosis (SSB), the base joint between the sphenoid and the occiput. The sphenoid influences the motions of the anterior cranial bones, the occiput influences the posterior cranial bones.

Therefore the sphenoid influences the following bones:
The ethmoid, the frontal bone, the vomer, the zygoma, the maxilla, the palatinum and the lacrimal.

Therefore the occiput influences the following bones:
The temporal bone, the os parietale, the mandibula, the first cervical vertebra and the sacrum.

3.2. HORMONAL INFLUENCES

The pituitary gland, as an important hormonal gland for birth, is the centre of the sphenoid in the fossa hypophysialis and is dependent on the rhythmic motions of the sphenoid.
In case of a malposition the functionality of the pituitary gland is restricted as well and thus, the correction is also a central point of my therapy.

Lechner (Roissaint, A.; Lechner, J. and van Assche, R. , 1991, 55-57) describes a study which examines the influence of cranial therapy on the pituitary gland with the help of bio-energetic methods of measurement.

His test results lead to two findings:

1. It was confirmed that cranial patterns of motion are of great importance.
2. With the help of the ascertainable results of the study it becomes easier for therapist to prove the phenomenon, which otherwise is hard to identify.

It follows that the position of the sphenoid plays an important role during birth.
Moreover, it follows that there are two more points of interest on which I want to elabourate: The conjunction os sacrum and occiput and sphenoid.
The dura mater is the process of the intrasacral dura and inserts in the second sacral vertebra. Therefore a dysfunction can be transmitted from the cranium to the sacrum and the other way round.
The sacrum moves in the same direction as the occiput and in the opposite direction as the sphenoid.
If for example there is a torsion between the sphenoid and the occiput there is a torsion of the sacrum between the ilias as well.
During birth this can lead to a harder passage of the child through the pelvis and to an influence on the production of hormones in the pituitary gland.

3.3. THE PHYSIOLOGIC MOTION OF THE SACRUM AND THE OCCIPUT

3.3.1. The Stage of Inspiration

The foramen magnum of the occiput moves to anterior – superior.
This results in a slight downward pull and subsequently the sacrum goes into flexion, the base of the sacrum goes to anterior – superior and the apex of the sacrum goes to anterior – inferior.

3.3.2. The Stage of Expiration

The intraspinal dural membrane moves to caudal. This results in an extension of the sacrum, the base of the sacrum goes to anterior – inferior and the apex of the sacrum goes to posterior – superior (cf. Fig.9).
Liem also describes the influences of these movements on other body structures during inspiration and expiration (Liem, T, 1998, 235-237).
Milne describes the movements of the occiput and sacrum (Milne, 1999, 93).

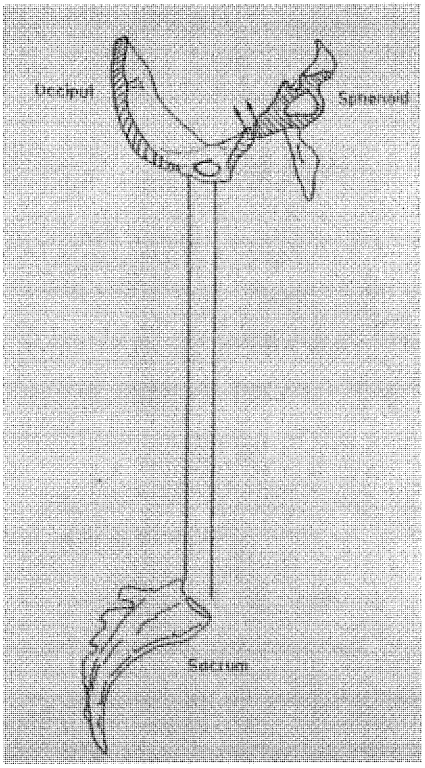


Fig. 9: The conjunction between os sacrum, occiput and sphenoid.

A malposition of the pituitary gland, an important hormonal gland for birth, reduces its functionality. Additionally, due to the conjunction of the os sacrum, occiput and sphenoid possible torsions of the sacrum between the ilias can be diagnosed, leading to a harder passage of the child through the pelvis.

4. BIRTH

4.1. GENERAL ASPECTS

During childbirth there is a transition from pre-labour pains which do not introduce labour to labour pains leading to delivery.
Labour occurs in regular intervals, independent of the pregnant woman's position and leads to an opening of the uterine orifice and a downward motion of the child into the female pelvis. The outflow of blood from the cervix canal and the premature breakage of the amniotic sac are typical for the onset of birth as well.

According to Gitsch (Gitsch, E. and Janisch, H., 1991 A, 30)
the combination of mechanic, endocrine, enzymatic and nervous factors is responsible for this process.
The distribution of oxytocin in the mother and the child increases. The tissue hormone prostaglandin is released to a higher extent. For this reason the correct position of the sphenoid plays an important role for the onset of birth.

Upledger (Upledger, J. E., 2000, 58) describes birth as a sequence of events that is pre-programmed for the mother as well as for the child. For Upledger birth is a therapeutic journey with the aim to prepare the child for a life outside of the uterus.
If this experience is prevented by a caesarean section or distorted by a vacuum extractor and a forceps delivery this can result in a "biological frustration", which becomes manifest later on in distortions in functionality or chronic pains.

Prerequisites for a birth without complications are the right sequences of mechanic, endocrine, enzymatic and nervous factors. Analogous to the postulated pre-programming for both, mother and child, the child's anatomy, especially the diameter of the child's head has an influence on the course of delivery, too.

4.2. FONTANELS OF THE CHILD'S HEAD

The sutures of the cranial bone are compounds consisting of connective tissue. There are two fontanels, which are covered with connective tissue and which are responsible for the changes in shape of the head during birth.
The triangular small fontanel is located next to the sutura lamdoidea. The square large fontanel is located next to the sutura coronalis

After entering the pelvis the child's head has to reduce in size:

The parietale goes backward, the right one goes over the left one.
The frontal bone goes downward and pushes its way under the parietale.
The occiput goes upward and goes below the parietal.

At the same time the baby's chin goes toward the chest and the height of the head goes to superior. The cervical spine stabilises and the nerves in this area are protected (Kaiser and Pfleiderer, 1989, 29).

4.3. THE DURATION OF THE BIRTH

It is important to find distinct criteria for the onset of delivery otherwise the data are highly error prone. In this chapter some literature data are summarised.

According to Möckl the stage of dilatation lasts 3-24 hours, the second stage of birth 1-2 hours for primiparous women (Möckl, 2006, 53).
According to Gitsch (Gitsch, E. and Janisch, H., 1991 A, 141) the average duration of birth for a primagravida is 18 hours, for a multigravida 12 hours.
The use of labour inducing medication reduced the duration of birth for primagravidas to 6 –7 hours, for multigravidas to 3 – 4 hours.

According to Bach-Jacobs (Bach – Jacobs, A., 1984) the first stage of birth lasts 6 – 12 hours for primagravidas and 3 –6 hours for multigravidas.

According to Martius (Martius, G., 1981, 250) the average duration of birth is 6 –7 hours for a primagravida and 3 –4 hours for a multigravida. His findings are based on the assumption that all measures to facilitate birth have been taken.

According to Bach-Jacobs birth starts when the rhythmic uterine contractions set in with a frequency of 5 –20 per hour (Bach – Jacobs, A., 1984, 44).

4.4. THE FIRST STAGE OF BIRTH

The first stage is the part of birth during which frequency of labour is rhythmic and the uterine orifice opens to 10 cm and performs a total regression afterwards.
The pelvis has to open in the pelvic inlet to allow the entering.
In this stage of birth the M. piriformis plays an important role based on the fact that the M. piriformis has the same base on the sacrum as the ligamentum uterosacrale.
If the muscle has a tension on one side the cervix uteri is pulled to this side. When this happens the uterine contractions cannot influence the cervix in an ideal way and thus the first stage of birth is prolonged.

Thus, this stage of delivery should be influenced by the extension of the m. piriformis and the m. iliopsoas, one of my main areas during osteopathic preparation.

Heller (Heller, A., 1998, 49) describes the uterine contractions as a shearing force. The contractions start in the fundus uteri where they last the longest.
Thus, the lower segments of the uterus which have weaker muscles and the cervix are pulled apart, a distraction takes place.
The child moves downward and this leads to an expansion of the cervix. Subsequently this leads to a dilatation.

The distraction and the dilatation lead to an opening of the uterine orifice. This results in a pressure on the child and it moves in the direction of lowest resistance toward the uterine orifice to expand it (cf. Fig. 10).

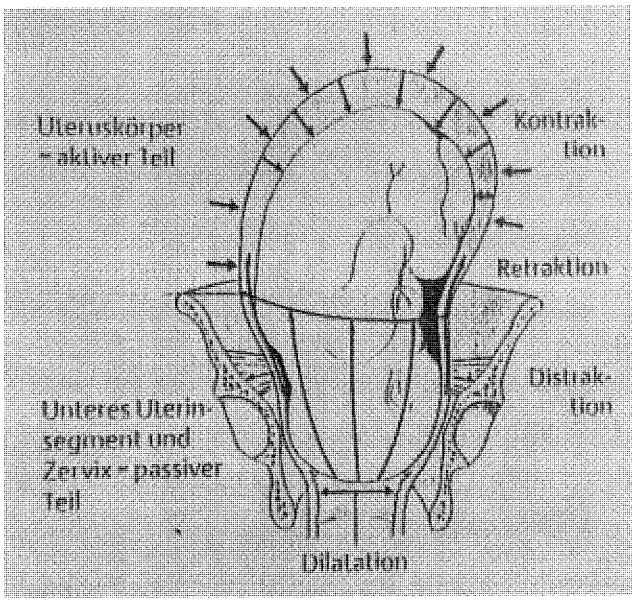


Fig. 10: The contractions of the fundus uteri lead to a distraction of the lower uterine segments and the dilatation of the cervix.

4.5. THE SECOND STAGE OF BIRTH

This stage starts when the uterine orifice has regressed and the cranium has reached the pelvic floor. It is the passage through the birth canal.
The bearing-down pains occur rhythmically and coordinated and the resistance of the pelvic floor is overcome by the woman's pressing. They occur with a frequency of up to 5 times per 10 minutes.

According to Martius (Martius, G., 1981, 266) this is an important, timesaving and birth-facilitating measure in this stage to overcome the reflex of skeletal muscles in form of a lordosis of the lumbal spine and a strong tension in the pelvic floor (cf. Fig. 11).

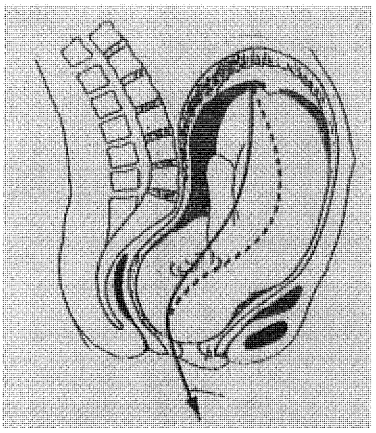


Fig. 11: Path of birth with a lordosis of the lumbar spine (dotted line) and without (full line).

The flexibility of the pelvic floor plays an important role in this stage of birth. Thus, my third main area of therapy, the resolution of tensions in the area of the pelvic floor, should help to shorten the time of delivery.

According to Molinari the pelvic floor can be seen as a kind of step where the baby's head slips downward during labour (Molinari, R. 2001).

The stimulus for expansion leads to a contraction of the muscle and pushes the baby further downward.

When the head exercises pressure on the first step of the m. levator ani the m. sacrococcygealis, its second contraction pushes the head back to the centre and thus it goes on to the second step, the m. iliococcygeal the contraction of which pushes the head back to the centre and it goes on toward the third step, the m. pubococcygeal.

After that an intern rotation takes place. The occiput moves toward the symphysis. When the head is born the child stretches its head to go through.

When the shoulders reach the pelvic floor an extern rotation takes place, they rotate in an antero-posterior diameter.

Then a slight lateral reflexion takes place in the trunk to allow the anterior shoulder to pass under the pubis and afterward the posterior shoulder comes and then an expulsive ejection of the remaining trunk.

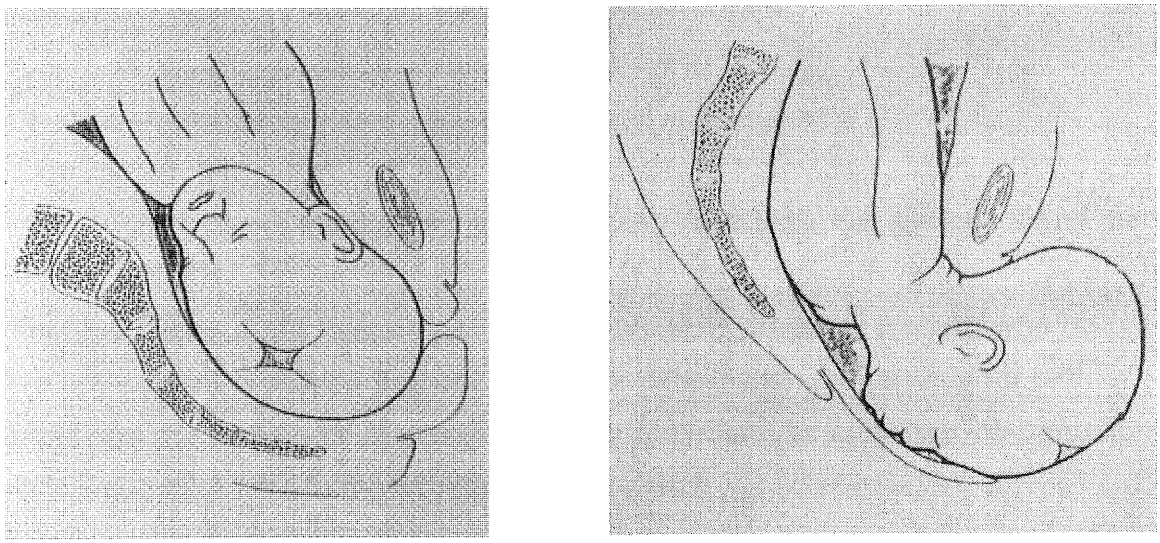


Fig. 12: Movement of the occiput toward the symphysis (left) and birth of the head (right).

For both stages of birth described above also an unrestricted function of the pelvis as well as the pituitary gland is essential.

4.6. THE BIRTH OF THE PLACENTA

According to Symonds (Symonds, E. M. and Symonds, I. M., 1998, 132) there is a third stage of birth. It starts with the birth of the child and ends with the expulsion of the placenta.

Due to placenta-contraction the uterus reduces in size, the placenta is released from its position. This stage lasts 10 to 60 minutes.

Martius (Martius, G., 1981, 248) describes this stage as afterpains which arise when the myometrium has adapted to the reduced filling. The shift between the wall of the uterus and the placenta leads to the removal of the placenta.

5. EXAMINATION AND TREATMENT

5.1.ANAMNESIS

In the course of an anamnesis the therapist talks with the patient about her current problems.
Within the scope of the present study there are only pregnant women who do not have any current problems and only come for osteopathic preparation for birth.
I explained the course of the treatment, my expectations and their co-operation with the questionnaire to the women in great detail.

5.2. EXAMINATION BASED ON THE FOUR MAIN AREAS

5.2.1. Main Area 1: The Bony Malpositions of the Pelvis

⇒ **At the beginning I started with taking up contact with the child**

The patient sits, the therapist stands behind her. The hands are on the right and on the left side of the abdomen and feel the motions of the child (cf. Fig. 13).

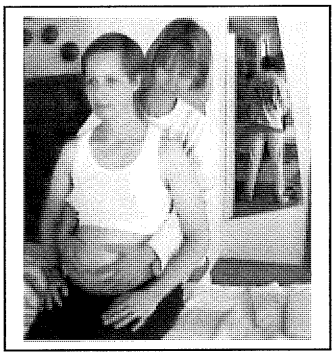


Fig. 13: Contact with the child.

⇒ **Observation of the forward bending test in a standing position**

According to Buckup (Buckup, K., 2000, 33) the sacrum rotates around a horizontal axis at the opposite of the Ileas and a motion of nutation takes place. When the ileosacral joint does not nutate on one side the spina iliaca posterior superior is pulled to cranial compared to the opposite side.

⇒ **Observation of the forward bending test in a sitting position**

Compare with the result of the forward bending test in a standing position.

When the forward bending test only takes place in a standing position the source of the problem is probably the upper extremity.

The forward bending test can point out a structural, muscular or fascial problem.

⇒ **Comparison of reference points**

Height of the shoulders, triangle of the waist, height of the iliac crest, and the gluteal fold, hollow of the knee, height of the malleolus.

⇒ **Test of the Michaelis rhombus**

A rhombus is drawn with a skin-friendly pen, the upper tip is on L5, the two lateral tips are the on the SIPS (Spina iliaca posterior superior) each, the lower tip is on the hiatus of the sacrum.

Between the two lateral tips a horizontal line is drawn.

Between the upper and the lower tip a vertical line is drawn.

The pregnant woman is advised to go from a standing position to a squatting position the heels must stay on the floor.

Now the therapist observes how the shape of the rhombus changes (cf. Fig.14).

A balanced opening of all tips of the rhombus would be the ideal result.

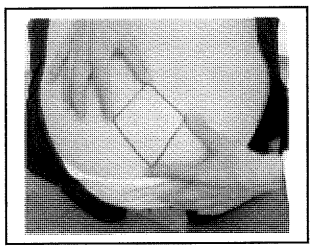


Fig. 14: Michaelis rhombus.

The following diagnostic features can be observed:

⇒ L5 is in extension: The upper part of the rhombus is too flat.

⇒ L5 is hypermobile: The upper tip becomes very high.

⇒ Dysfunction in the hip: The lower tip of the rhombus deviates to one direction. If the deviation is at the beginning of the motion the knee or the ankle joint of the same side are concerned. Is the deviation at the end of the motion the knee or the ankle joint of the other side are concerned.

⇒ Sacrum in conternutation: The lower tip of the rhombus becomes too long.

⇒ Torsion of the sacrum: The horizontal line becomes oblique.

⇒ Pull of the fascia thorakolumbalis: The squatting position with the heels on the floor is not possible.

⇒ Shortening of the ligaments iliolumbalia: The distance between L5 and PSIS does not widen.

⇒ **Examination of the ilium**

The therapist palpates the Spina iliaca anterior superior to find out whether they are anterior or posterior or whether there is an inflair or an outflair. He also checks this on both sides of the Malleolus.

⇒ **Examination of the os pubis**

The therapist stands at the side. He clasps the pubis. The pregnant woman makes a running motion with her legs and the therapist checks on the motion of the pubis (cf. Fig. 15).

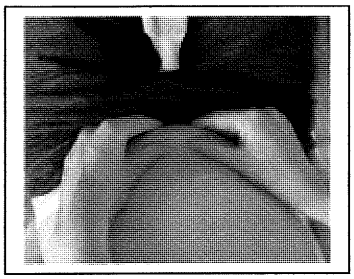


Fig. 15: Examination of the os pubis.

⇒ **Examination of the coccygis**

The patient sits, the therapist stands behind her and places the middle finger of the caudal hand on the apex of the coccygis.

The aim is to check whether there is a higher pressure palpable during inspiration and whether this pressure disappears during expiration.

The cranial hand exercises pressure on the shoulder, which leads to a side-bending to this side. The coccygis goes to the same side.

Furthermore the softness of the tissue is palpable.

5.2.2. Main Area 2: The M. Piriformis and the M. Iliopsoas

⇒ **Examination of the musculus psoas**

The examination was done according Kendall, 1988, 161: The patient is in a dorsal position, the therapist stands at the side and flexes the hip as strong as possible. At the same time he observes whether this lifts the thigh on the opposite side.

⇒ **Examination of the musculus piriformis**

The musculus piriformis was examined according Kendall, 1988, 70:

The patient is in a dorsal position, the therapist stands at the foot of the table and examines the intern rotation while the leg is stretched.

On the side where there is less intern rotation the musculus piriformis is in restriction.

5.2.3. Main Area 3: The Area of the Pelvic Floor

⇒ **Examination of the musculus obturatorius internus**

The patient is in a dorsal position, one leg is bent with the sole of the foot resting on the table. The therapist stands at the side and supports the bent leg of the pregnant woman.

He runs his thumb or his fingertips up the adductors to the obturator membrane and palpates the tension.

⇒ **Examination of the musculus levator ani:**

The patient is in a dorsal position, the leg is bent by 90° in the hip joint, the therapist goes to one side and goes with his thumb over the membrana obturatoria.

At a flexion of the hip of 90° the therapist is on the post fibres of the pelvic floor and the pressure the thumb exercises goes downward in the direction of the table.

At a flexion of the hip of 45° the therapist is on the middle fibres.

The pressure the thumb exercises goes toward the patient's head.

At a flexion of the hip of 20° the therapist is on the anterior fibres.

The pressure the thumb exercises goes toward the patient's head.

⇒ **Examination of the pelvic floor**

The patient is in a dorsal position, the therapist stands at the side.

With one finger he is on the central point of the pelvic floor. The other two fingers are on the backside of the wall and exercise slight pressure to palpate the responding central point.

5.2.4. Main Area 4: The Cranial Motions

⇒ **Examination of the cranial motions of the sacrum**

The patient lies on her back, the therapist sits at her side.

The legs of the pregnant woman are bent, the soles of her feet rest on the table.

The therapist has the palm of his hand below the sacrum and examines the motions of the cranial system.

He checks whether there is a malposition and observes the motions of the cranial rhythm.

⇒ **Examination of the cranial movements of the symphysis spheno-basiliaris (SSB)**

The patient lies on her back, the therapist sits at the head of the table and examines the SSB.

He checks whether there is a malposition and observes the motions of the cranial rhythm.

⇒ **Examination of the mutual motions of the sacrum and the occiput**

The patient lies on her side, the therapist sits behind her.

The cranial hand is on the occiput, the caudal hand on the sacrum. Thus, the therapist examines the motion of the two bones.

5.3. TREATMENT

5.3.1. General Description

My treatment mainly concerned four areas:

- For the correction of bony malpositions of the pelvis or the sacrum I used techniques according to Mitchell. The coccygis was treated with a direct technique.

- I used one of the techniques according to Mitchell to extend the m. piriformis and the m. iliopsoas.

- Furthermore I used soft parts- and inhibition-techniques on the pelvic floor

- For cranial work I used indirect techniques on the SSB and on the sacrum

Furthermore all malpositions which I have found in the course of the examination have been corrected:

- For the correction of malpositions of the spine I used structural techniques.

- For the resolution of tensions in the area of the diaphragm I used visceral techniques

- For the correction of malpositions in the peripheral areas I used structural techniques.

5.3.2. Main Area 1: Correction of Bony Malpositions of the Pelvis

Description of the most important techniques:

⇒ The Ilium is anterior:

Starting position:

Dorsal position, the leg on the relevant side is bent, the sole of the patient's foot touches the table. The therapist stands at the side, his shoulder is at the level of the patient's knee.

Position of the hand:

The medial hand has contact with the fist medial of the tuber ischiadicus.

The thumb of the lateral hand palpates the SIAS (cf. Fig. 16).

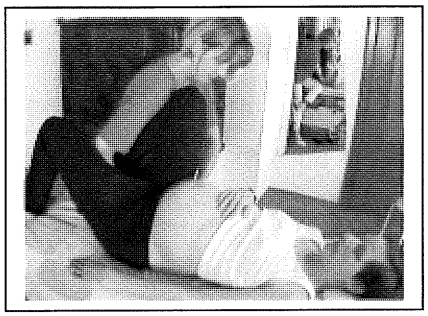


Fig. 16: Position during the correction of an anterior ilium.

Mobilisation:

The medial hand makes a slack on the SIAS. During inspiration the patient slightly presses her knee against the therapist's shoulder and keeps this pressure for a few seconds.

During expiration the therapist pushes the tuber to cranial and searches for a new motor barrier until the tension is palpable on the SIAS (spina iliaca anterior superior) again. The objective of the treatment is to mobilise the ilium to posterior.

⇒ The ilium is posterior:

Fig. 17: Position during the correction of a posterior ilium.

Starting position:

Dorsal position, the leg of the relevant side hangs from the therapy bed.

The therapist stands at the side.

Position of the hand:

The cranial hand is on the controlateral SIAS.

The caudal hand is on the homolateral knee (cf. Fig. 17).

Mobilisation:

The therapist looks for a motor barrier by bringing the leg to extension.

For about 7 –10 seconds the patient presses her leg against the resistance of the therapist in flexion and slightly in abduction.

During the relaxation a further motor barrier is looked for by increasing the extension of the leg.

⇒ The Pubis is anterior-inferior:

This is the hypomobile side

Starting position:

Dorsal position, the relevant leg is bent, the sole of the patient's foot touches the table. The therapist stands at the foot of the table.

Position of the hand:

The medial hand has contact with the fist, medial from the tuber ischiadicus.

The thumb of the lateral hand palpates the SIAS.

Mobilisation:

The medial hand makes a slack on the SIAS.

During inspiration the patient presses her knee against the therapist's shoulders and stays in this position for seven to ten seconds.

During expiration the therapist pushes the Tuber to cranial and searches for a further motor barrier until the tension is palpable again on the SIAS.
The objective of the treatment is to mobilise the pubis to anterior-posterior.

⇒ The Pubis is posterior-superior:

This is the hypermobile side.

Starting position:

Dorsal position, the relevant leg hangs from the side of the table.
The therapist stands at the side.

Fig. 18: Position during the correction of a posterior-superior pubis.

Position of the hand:

The cranial hand is on the controlateral SIAS.
The caudal hand is on the thigh (cf. Fig. 18).

Mobilisation:

During inspiration the patient slowly pushes her leg upward against the resistance of the therapist.
During expiration the patient lets the leg fall on the table.
The therapist slows down the falling movement and at the same time pulls the leg to caudal.
The objective of the treatment is to mobilise the pubis to anterior and inferior.

⇒ Technique for the superficial fasciae between the sacrum and the coccygis. The objective of this technique is to bring the coccygis to extension, according to Molinari (Molinari, R., 2001).

Starting position:

The patient is on all fours, the therapist stands at the side.

Position of the hand:

The fingertips of the cranial hand are located on the base of the Sacrum.

The thumb of the caudal hand is on the proximal end of the coccyges (cf. Fig. 19).

Fig. 19: Treatment of the superficial fasciae between the sacrum and the coccyges.

Mobilisation:

The patient rests on her elbows and slowly shifts her position in order to sit on her heels, the therapist pulls both hands to cranial.

The objective is to bring the coccygis into extension.

The caudal hand can either clasps the coccygis or, when the coccygis cannot be clasped entirely, the hand is positioned on the surface.

5.3.3. Main Area 2: Extension of the M. Piriformis and the M. Iliopsoas

⇒ Extension of the Musculus Piriformis according to Molinari (Molinari, R., 2001):

Starting position:

The patient lies on her back,

the leg is bent by 90° in the hip and the knee.

The therapist stands at the homolateral side.

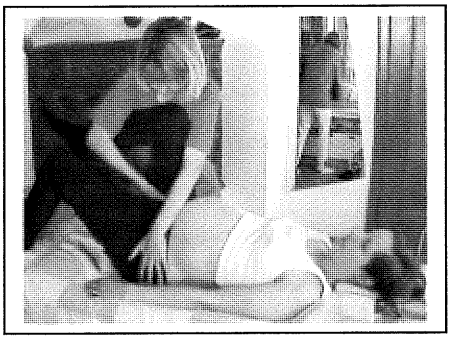


Fig. 20: Extension of the musculus piriformis

Position of the hand:

The cranial shoulder clasps the knee joint and the cranial hand props up on the table.

The lower leg is stuck in the patient's caudal shoulder.

The caudal fingers clasp the thigh from medial.

Mobilisation:

Slight decoaptation of the hip joint to lateral. The cranial shoulder puts weight on the axis of the fermur.

The patient presses her lower leg for 7 – 10 seconds against the therapist's caudal elbow .

During the relaxation a further motor barrier is looked for by putting the leg in intern rotation and adduction.

⇒ **Extension of the lower part of the musculus psoas:**

Starting position:

The patient lies on her back, the relevant leg hangs down at the end of the table.

The controlateral leg is flexed in the hip joint and in the knee joint.

The therapist stands at the foot of the table.

Position of the hand:

One hand is on each knee. In addition the therapist fixates the lower leg of the patient's hanging leg with his leg slightly to the outside.

Mobilisation:

The therapist looks for a motor barrier by flexing the controlateral leg until the leg comes up. The patient pushes her leg toward the ceiling for 7 –10 seconds.

During the relaxation a further motor barrier is looked for by increasing the extension of the leg.

⇒ **Extension of the upper part of the musculus psoas according to Molinari (Molinari, R., 2001):**

Starting position:

The patient lies on her back, the legs are bent, the soles of her feet rest on the table. The legs are in abduction and external rotation, the heels touch each other.

The therapist stands at the side.

Position of the hand:

The cranial hand is on the diaphragm.

The caudal hand is below the sacrum.

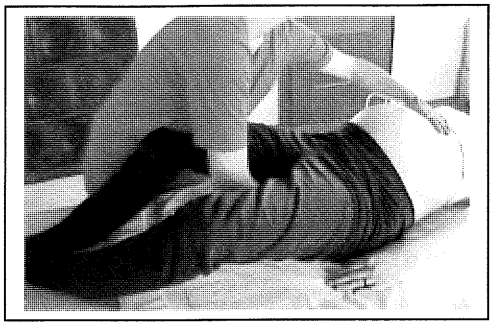


Fig. 21: Position during the extension of the upper part of the m. psoas

Mobilisation:

The patient is advised to slowly stretch her legs during expiration and at the same time hold the soles of the feet together as long as possible.

At the same time the therapist pulls the sacrum to conternutation.

During expiration the diaphragm automatically goes to cranial. Therefore the therapist has to exercise pressure on it to hold it to posterior and caudal. This procedure is repeated three times.

5.3.4. Main Area 3: Resolution of Tensions in the Area of the Pelvic Floor

⇒ **Pelvic floor technique:**

Starting position:

The patient lies on her back, the therapist sits at her side on a level with the pelvis.

Position of the hand:

The middle and the index finger of the caudal hand are medial from the tuber in the fossa ischiorectalis.

The second hand lies below the sacrum.

Mobilisation:

The sacrum is brought into flexion and thus the pelvic diaphragm is lowered.

The patient makes a deep inspiration and holds her breath as long as possible. In the meantime the therapist looks for the point of balance between the diaphragm and the tentorium cerebelli.
During the spontaneous expiration the pelvic diaphragm moves to superior.

⇒ **Treatment of the Musculus Levator Ani:**

Starting position:
The patient lies on her back, the leg is flexed by 90° in the hip joint.
The therapist stands at the side.

Position of the hand:
With his thumb the therapist goes in via the membrana obturatoria

Mobilisation:
Starting position see Examination of the M. levator ani on page 31.
During each inspiration the therapist's thumb goes in deep enough to feel a pressure against the thumb.
Then the thumb in its turn exercises pressure. The therapist lets the body come to terms with the lesion. At the end of a deep inspiration the therapist lets go slowly.

5.3.5. Main Area 4: Correction of the SSB and the Sacrum

⇒ **Correction of a dysfunction of the SSB:**

Starting position:
The patient lies on her back, the therapist sits at the head of the table and props his elbows on the table.

Fig. 22: Correction of a dysfunction of the SSB.

Position of the hand:

The therapist uses the basis hold according to Sutherland. The hands are on both sides of the cranium. The index fingers are behind one lateral corner of the eye each on the large ala ossis sphenoidalis.

The middle fingers are in front of the ear on the temporal bone each.

The ring fingers are behind the ear on the temporal bone each.

The small fingers are on the asterion each, lateral, at the level of the occiput.

The two thumbs touch each other above the cranium and form an external focal point.

Mobilisation:

The therapist palpates the motion of extension and flexion.

Then the therapist orients himself on the relevant malposition because that's where the largest extent of the motions takes place.

Now the therapist tries to find a point in which the false membranous tensions of the joint are balanced to each other.

This point of balance is between the normal room to move and the blocked motions.

Then a harmonisation with the liquid point of balance is reached and the SSB has to be kept in this position.

Now the self-healing abilities can conduct a correction.

Then the relaxation of the restriction of the motion is palpable and a harmonic motion of flexion and extension takes place.

⇒ Swing of the Dural Tube according to Sutherland:

Starting position:

The patient lies on her side, the legs are flexed,

The head is bent, the therapist sits behind her.

Position of the hand:

The cranial hand is on the occiput.

The caudal hand is on the sacrum.

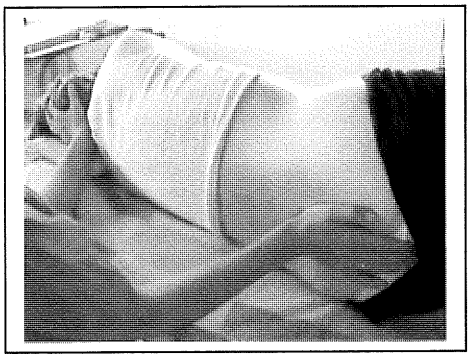


Fig. 23: Swing of the dural tube.

Mobilisation:

The hand on the occiput slightly pulls to cranial.

The hand on the sacrum slightly pulls to caudal.

To do so the therapist shifts his body slightly and pulls until a relaxation is palpable in the dural tube.

Then the rhythm of extension and flexion is followed by a swinging motion.

Thus, slight asymmetries can be corrected.

6. METHODOLOGY

6.1. EXPLANATION OF THE PROCEDURE

All together 40 primiparous women matching the inclusion and exclusion criteria summarised in the next subchapter participated in the study. Precisely half of them, i.e. 20 women, were prepared for birth with osteopathic examinations and treatments according to the procedures presented in chapter 5. Three treatments between the 32. and the 38. week of pregnancy were appointed with them.
After birth all women answered several questions concerning the duration of birth and the general course of birth (cf. questionnaire in chapter 6.2.). The prime objective of the present study is a comparison of the duration of birth in both groups.

6.1.1. Selection of the test persons

The test persons were selected under consideration of the following inclusion and exclusion criteria:

- Only primagravidas between 20 and 35 years of age
- No risk factors like diabetes or gestosis gravidarum
- No neurological diseases (like multiple sclerosis) or rheumatic diseases
- No problems related to the lumbar spine during the past year
- No use of labour supporting devices or medication in no stage of birth
- Delivery takes place between the 37. and the 42. week of pregnancy
- No aids like for example a vacuum extractor must be used
- The child must be in a head presentation.

6.2. THE QUESTIONNAIRE

Questionnaire on the duration of birth

1. Age ⌊_⌋⌊_⌋

2. In which week of pregnancy did delivery take place?

37	38	39	40	41	42
○	○	○	○	○	○

3. How did birth start?

with the breakage of the amniotic sac	with a slight ache in the abdomen	with labour
○	○	○

Subsequently I ask you for detailed information with regard to the chronological course of birth (please answer these questions as accurately as possible; if you cannot remember exactly please try to estimate the time as exactly as possible)

4a. When did the admission to hospital take place?

day: ⌊_⌋⌊_⌋ month: ⌊_⌋⌊_⌋ time: ⌊_⌋⌊_⌋ :⌊_⌋⌊_⌋

4b. When where you brought to the delivery room?

day: ⌊_⌋⌊_⌋ month: ⌊_⌋⌊_⌋ time: ⌊_⌋⌊_⌋ :⌊_⌋⌊_⌋

4c. When did labour start in intervals of 5 minutes with a minimum duration of 1 minute?

day: ⌊_⌋⌊_⌋ month: ⌊_⌋⌊_⌋ time: ⌊_⌋⌊_⌋ :⌊_⌋⌊_⌋

4d. When was the exact time of birth of your child?

day: ⌊_⌋⌊_⌋ month: ⌊_⌋⌊_⌋ time: ⌊_⌋⌊_⌋ :⌊_⌋⌊_⌋

5. How long did the period of bearing-down pains take?

0-5 min.	5-10 min.	10-15 min.	15-20 min.	20-25 min.	> 25 min.
○	○	○	○	○	○

6. Was an episiotomy carried out?

yes	no	tore itself
○	○	○

7. When did the placenta come?

5-10 min. later	10-20 min. later	20-40 min. later	40-60 min. later	1 - 2 h later
○	○	○	○	○

8. Sensibility to pain: Each birth is connected with severe pain. Even so, every woman experiences the pain felt during birth in a different way. According to your assessment: how painful was your birth? (as compared to descriptions of other women's deliveries or to similar indications) **on a scale from 1 to 10? please orient yourself by the categories from „painful" to „hardly endurable pain" in the scale.**

painful				extremely painful				hardly endurable pain	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Please answer all questions of the questionnaire!

Thank you for your co-operation!

6.3. EXPLANATION OF THE QUESTIONNAIRE

It is very difficult to limit a birth to an exact period of time. Therefore I orient myself by the moment of admission to hospital and an interval of labour pains of five minutes with a minimal duration of one minute. This is a guideline also midwives rely on.
One question is concerned with the subjective sensibility to pain to find out whether there are differences in this field.

6.4. STATISTICAL EVALUATION

6.4.1. Descriptive Evaluation

The prime objective of the present study is a comparison of the duration of birth in both groups. First of all the most important findings of the survey are described.
Hereby the distribution of certain characteristic features such as age or date of birth should be relatively similar in both groups to avoid certain sources of interference on the variables examined later on.

6.4.2. Statistical Comparison

After the sample has been characterised according to different features in the previous section, differences between the test group and the control group are evaluated according to statistical methods. For the comparison of two groups the t-test for independent samples is suitable.

7. RESULTS OF THE STATISTICAL EVALUATION

7.1. DESCRIPTIVE EVALUATION

7.1.1. Distribution of Age

The average age of the women participating in the study was 30.5 years.
Table 1 shows the distribution of age groups within both groups of women. The distribution of the individual age brackets is relatively similar in both groups.

	test group		control panel		total	
age brackets	n	%	n	%	n	%
25 to 27 years	4	15,8	3	15,0	7	15,4
28 to 30 years	6	31,6	9	45,0	15	38,5
31 to 33 years	8	42,1	3	15,0	11	28,2
34 to 36 years	1	5,3	4	20,0	5	12,8
37 years and up	1	5,3	1	5,0	2	5,1
total	20	100,0	20	100,0	40	100,0

Tab. 1: Distribution of age in both groups

The majority of women in the test group is between 28 and 33 years old, only about 15% are younger than 27 years and slightly over 10% are older than 33 years. In the control group the majority of women is between 28 and 33 years old with nearly half of the women being between 28 and 30 years of age. The percentage of women between 34 and 36 years of age with exactly 20% is slightly above average.

7.1.2. Distribution of the Time of Birth

The largest part of women in the present study (35%) gave birth to their child during the 40th week of pregnancy. Another third gave birth one week after the calculated date. 10% of women gave birth during the 38., 39. or 42 week of

pregnancy. One woman gave birth to her child in the 37. week. The distribution of the moment of birth does not differ strongly in both groups (cf. Tab. 2).

	test group		control group		total	
Time	n	%	n	%	N	%
37. week	1	5,0	0	0,0	1	2,5
38. week	3	15,0	1	5,0	4	10,0
39. week	2	10,0	2	10,0	4	10,0
40. week	8	40,0	6	30,0	14	35,0
41. week	5	25,0	8	40,0	13	32,5
42. week	1	5,0	3	15,0	4	10,0
Total	20	100,0	20	100,0	40	100,0

Tab. 2: Distribution of the time of birth in both groups

7.1.3. Onset of Birth

In both groups delivery started for one third of pregnant women each with the breakage of the amniotic sac, with an ache in the abdomen or with the onset of labour (cf. Tab. 3).

	Test group		Control group		Total	
Onset of birth	n	%	n	%	N	%
Breakage of the amniotic sack	7	35,0	6	30,0	13	32,5
Ache in the abdomen	7	35,0	6	30,0	13	32,5
Labour	6	30,0	8	40,0	14	35,0
Induction of labour	0	0,0	0	0,0	0	0,0
Total	20	100,0	20	100,0	40	100,0

Tab. 3: Distribution of the onset of birth for both groups

None of the women taking part in this study needed an induction of labour.

7.1.4. Duration of the Bearing-Down Pains

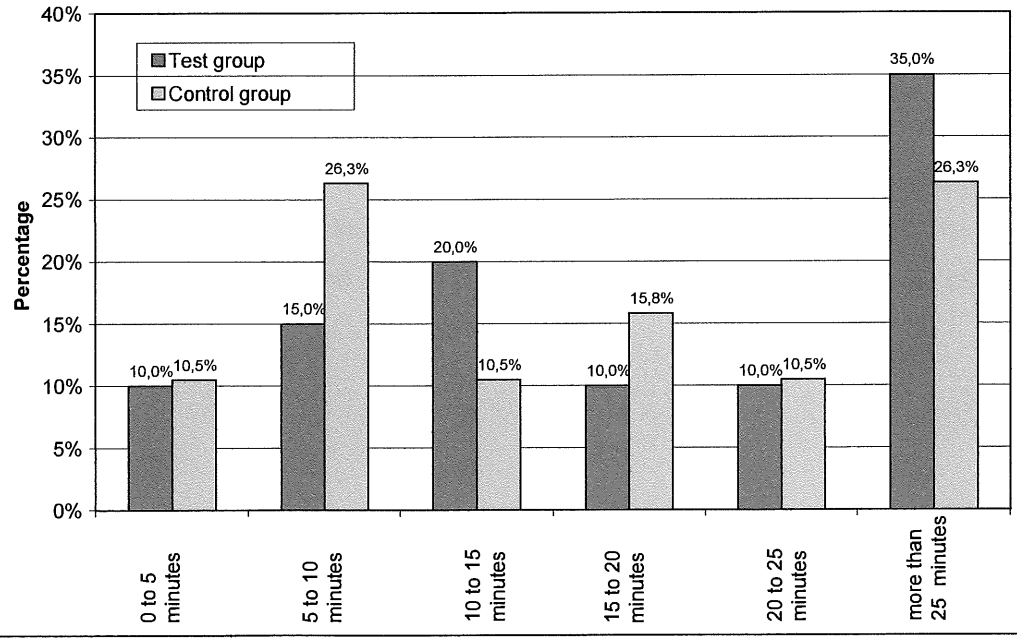
All pregnant women experience a different duration of bearing-down pains. The percentages in the individual categories are between 10% and 20% in both groups. Only the category over 25 minutes comprises 30% of women (cf. Tab. 4).

	Test group		Control group		Total	
Duration	n	%	n	%	N	%
0 to 5 minutes	2	10,0	3	10,5	5	10,0
5 to 10 minutes	3	15,0	5	26,3	8	20,0
10 to 15 minutes	4	20,0	2	10,5	6	15,0
15 to 20 minutes	2	10,0	3	15,8	5	12,5
20 to 25 minutes	2	10,0	2	10,5	4	10,0
more than 25 minutes	7	35,0	5	26,3	12	30,0
Total	20	100,0	20	100,0	40	100,0

Tab. 4: Distribution of the duration of the bearing-down pains for both groups

Figure 24 shows the distribution of the duration of the bearing-down pains for both groups graphically.

Figure 24: Distribution of the duration of bearing-down pains for both groups



There are larger deviations in the categories "5 to 10 minutes" and "15 to 20 minutes" with a noticeable higher percentage in the control group in both categories. In the categories "10 to 15 minutes" and "more than 25 minutes" the percentage in the test group is noticeable higher.

7.1.5. Episiotomies and other Perineal Injuries

Half of the women did not have an episiotomy carried out. With 60% this percentage is noticeably higher in the panel than in the control group. In 40% of cases an episiotomy was necessary, the remaining 8% belong to the category "tore itself" (cf. table 5).

	Test group		Control group		Total	
Episiotomy	n	%	n	%	n	%
Yes	7	35,0	9	47,4	16	41,0
No	12	60,0	8	42,1	20	51,3
Tore itself	1	5,0	3	10,5	4	7,7
Total	20	100,0	20	100,0	40	100,0

Tab. 5: Distribution of episiotomies

7.1.6. Period of Time before the Placenta Starts

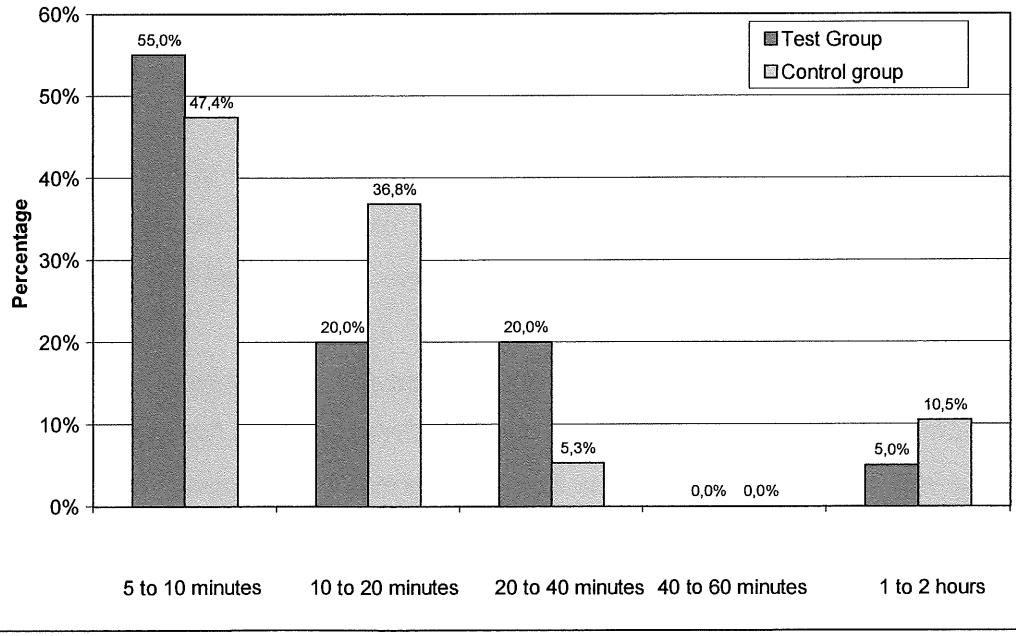
The period of time before the placenta starts varies between 5 minutes and 2 hours, with the percentage of women declining continuously as the duration increases. In more than half of the cases the duration until the start of the placenta lies between five and ten minutes, in nearly 13% this period of time is ten to twenty minutes. And in nearly 13% of deliveries this period of time takes between 20 and 40 minutes. With only three women, or 8% of the sample, the period of time before the placenta started was more than one hour (cf. table 6).

Duration	test group		control group		total	
	n	%	n	%	n	%
5 to 10 minutes	11	55,0	9	47,4	20	51,3
10 to 20 minutes	4	20,0	8	36,8	12	28,2
20 to 40 minutes	4	20,0	1	5,3	5	12,8
40 to 60 minutes	0	0,0	0	0,0	0	0,0
1 to 2 hours	1	5,0	2	10,5	3	7,7
Total	20	100,0	20	100,0	40	100,0

Tab. 6: Distribution of the periods of time before the placenta for both groups

Figure 25 shows the distribution of the individual time categories for both groups graphically. It shows that there are several noticeable differences between the two groups. The test group shows a clearly higher percentage in the time category "5 to 10 minutes" while the control group shows a disproportionate frequency in the category "10 to 20 minutes". The same applies in a toned down way to the categories "20 to 40 minutes" and "1 to 2 hours".

Figure 25: Distribution of the periods of time before the placenta for both groups



7.1.7. Individual Points in Time of the Phases of Birth

The women were also questioned on the individual points in time of the phases of birth. Their answers allowed the calculation of the time that lies between the individual events, which is the basis for the examination of the underlying question of the present study. A summary of these data is given in table 7 (md...median, sd... standard deviation, min... minimum value, max...maximum value).

	index value				
Variable	mean	sd	md	min	Max
Duration from admission to delivery room*	1,32	2,39	0,50	0,00	11,00
Duration from delivery room to onset of labour*	1,57	3,72	0,00	0,00	19,00
Duration from onset of labour to birth*	4,29	2,72	3,43	0,43	10,63
Duration from admission to birth*	7,17	5,65	5,12	1,09	29,33
Pain +	5,26	2,75	5,00	1,00	10,00

Tab. 7: Descriptive index values for individual characteristic features of birth.
* in hours
+ on a scale from 1 to 10

On average birth lasts more than seven hours from the moment of admission to the hospital until delivery with the range of deviation between the shortest and the longest birth in the sample being more than one day. One women took slightly more than one hour to give birth while another woman's child was born after a nearly 30 hour stay in hospital. The median, which means that the duration of birth for one half of the women of the sample lies below this value and the other half lies above it, was slightly more than five hours.

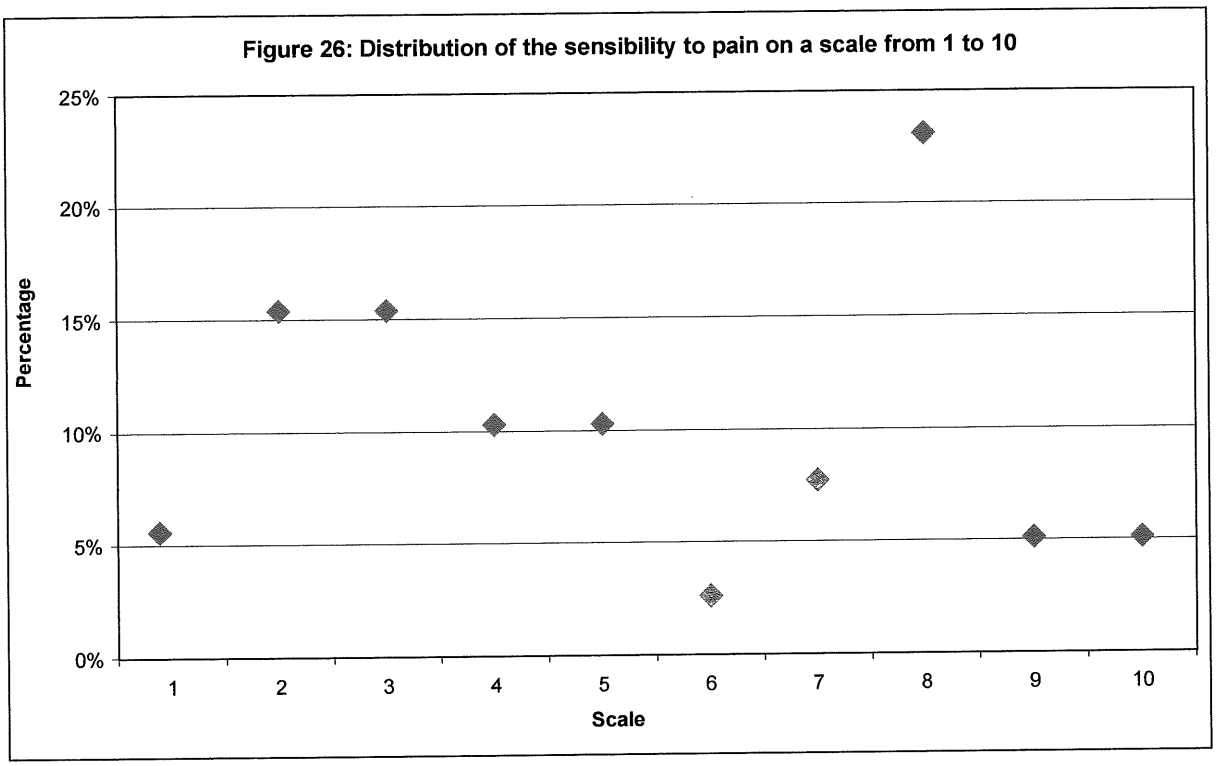
The longest phase during birth is the period of time from the onset of labour to the moment of delivery (birth in the narrow sense). On average this period lasts about four hours. Here there is a large range of deviation for the women of the sample as well with the shortest time being 25 minutes and the longest "duration of labour" of a woman being more than ten and a half hours. With three and a half hours the median lies noticeably above the mean.

On average it takes slightly more than one hour from the moment of admission to hospital to the transfer to the delivery room. More than half of the women are transferred to the delivery room after less than half an hour, some women are brought to the delivery room immediately after their arrival in hospital.

On average labour starts after one and a half hours in the delivery room, this value also being distorted by "extreme periods". The median ("md") of zero hours shows that this period of time is noticeably shorter for most women and that labour has already started when the women arrive in the delivery room.

7.1.8. Pain sensibility

In addition, the women had to assess their individually felt pain during birth on a scale from one to ten. On average this value is 5.26 with the strength of the pain felt being assessed very differently. In general it must be said that such a self-assessment is not easy for the women since every birth is connected with strong pain and a measurement of pain relatively to the pain other women experienced during birth can only be based on descriptions and accounts.
However, for a comparison between two samples, which are designed to balance inter-individually different frames of reference such a question seems to be justifiable. The percentages of the individual categories are shown graphically in figure 26.



7.2. STATISTICAL COMPARISON

As said above, the goal of this study was to prove that the duration of birth, especially the time from the onset of labour to the birth of the child can be shortened with an osteopathic preparation of the pregnant woman as compared to a "normal preparation for birth".
The dependent variables are the periods of time of the individual phases of birth as described in the section above.

7.2.1. Time between the Onset of Labour and the Delivery

First of all the means of the basic variable, which is the time between the onset of labour and the delivery, will be compared to each other. Hereby the labour pains occurring in intervals of five minutes with a minimum duration of one minute each were taken as a starting point.

Table 8 shows that the means differ noticeably between the two groups.

Group	mean	sd	t-value	p
Control group	5,14	2,67		
Test group	3,45	2,57	2,05	**.048**

Tab. 8: Differences in the means of the period of time between the onset of labour and the delivery in hours between the control group and the test group

While the period of time between the onset of labour and delivery lasts more than five hours on average for women without osteopathic treatment the average time for women with osteopathic treatment is three and a half hours that is one and a half hour less.

There are strong dispersions in both groups. However, the difference can be proven with the level of significance of 5%. It therefore seems that osteopathic treatment leads to a considerable reduction in the average duration of birth.

7.2.2. Time from Admission to Hospital to the Transfer to the Delivery Room

There is no difference in the period of time from admission to hospital to the transfer to the delivery room for the two groups (cf. Tab. 9). However, this was expected since this period of time depends on many external factors, which are not connected with the kind of preparation for birth. In both groups this period of time lasts about one hour and 20 minutes.

Group	mean	sd	t-value	p
Control Group	1,28	2,46		
Test group	1,35	2,38	0,10	.918

Tab. 9: Differences in the means of the period of time from admission to the hospital to the transfer to the delivery room in hours between the control group and the test group

7.2.3. Time from the Moment of Arrival in the Delivery Room to the Start of Labour Pains

Table 10 shows noticeable differences in the means of the period of time from the moment of arrival in the delivery room to the start of labour pains between the two groups. For the women without osteopathic treatment (control group) this period of time lasts over two hours, which is nearly twice as long as for the test group. However, there is a strong dispersion in periods of the individual women, which means that the difference, which seems to be obvious at first cannot be confirmed with statistical methods.

Group	mean	sd	t-value	p
Control group	2,01	4,67		
Test group	1,12	2,47	0,76	.455

Tab. 10: Differences in the means of the duration between arrival in the delivery room and the onset of labour in hours between the control group and the test group.

7.2.4. Total Time in Hospital

As far as the total time a woman spends in hospital before her child is born is concerned it turns out that in the control group the mean is clearly higher (cf. table 11). In the control group the mean lies more than two and a half hours above the mean of the women in the test group. However, the difference cannot be proved with sufficient certainty.

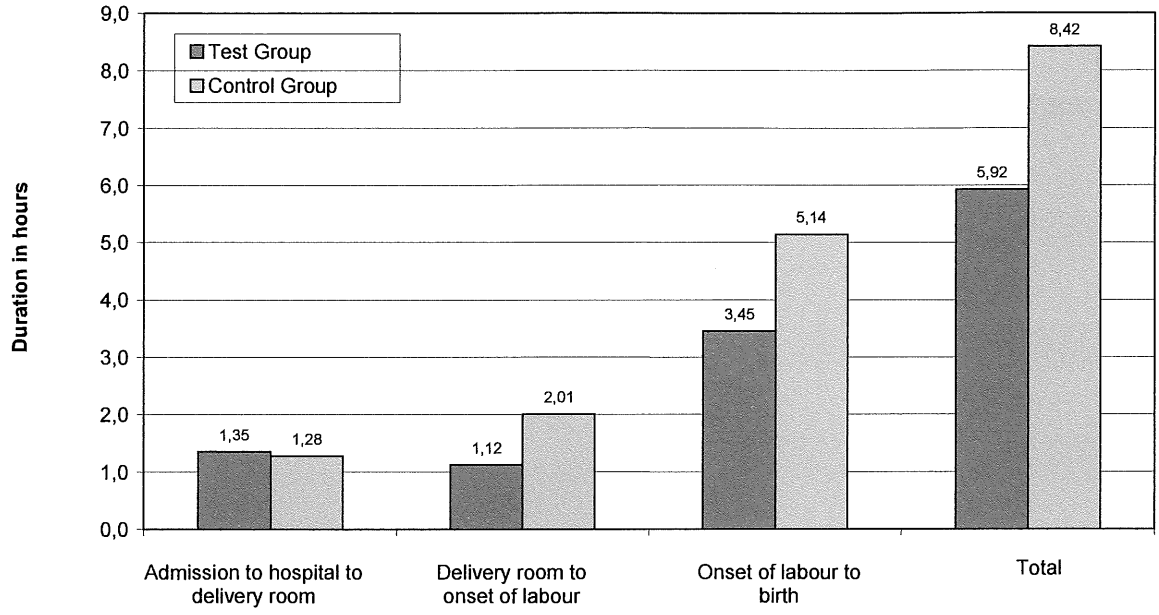
Group	mean	sd	t-value	p
Control group	8,42	6,30		
Test group	5,92	4,73	1,42	.163

Tab. 11: Differences in the means of the duration from admission to the hospital to delivery in hours between the control group and the test group

7.2.5. Summary of the Individual Phases

Figure 26 shows the means for the individual phases of birth graphically.

Figure 26:Distribution of the duration of the individual stages of parturition in both groups



Taking all this into consideration the research question underlying the present study can be answered affirmatively.

The actual duration of birth – that is the period of time from the onset of labour to the actual birth of the child - is noticeably shorter for women who have been treated according to osteopathic methods during pregnancy than for women without such treatment.

7.2.6. Extent of Pain felt during Birth

As mentioned above the women were also questioned on the pain felt during birth. It has been examined if and to what extent the means of the two groups differ. On average the control group experienced birth as much more painful than the women in the test group who are more than one point in the scale below the women in the control group (cf. Tab. 12).

Group	Mean	sd	t-value	p
control group	5,79	2,72		
test group	4,75	2,75	1,19	.243

Tab. 12: Differences in the mean of the extent of the pain felt during birth between the control group and the test group

The deviations of the values are very high. Therefore random divergences cannot be excluded with sufficient certainty.

8. SUMMARY AND DISCUSSION

All together 40 primiparous women participated in the study. Precisely half of them, i.e. 20 women, were prepared for birth with osteopathic methods. Three treatments between the 32. and the 38. week of pregnancy were appointed with them.

The examination and treatment focussed on the following four main areas:

1. Correction of bony malpositions of the pelvis
2. Extension of the M. piriformis and the M. iliopsoas
3. Resolution of tensions in the area of the pelvic floor
4. Correction of the SSB and the os sacrum

After birth all women answered several questions concerning the duration of birth and the general course of birth.

In both groups delivery started for one third of pregnant women each with the breakage of the amniotic sac, with an ache in the abdomen or with the onset of labour. None of the women taking part in this study needed an induction of labour.

The longest phase during birth is the period of time from the ***onset of labour to the moment of delivery*** (birth in the narrow sense). On average (both groups) this period lasts about four hours. Here there is a large range of deviation for the women of the sample as well with the shortest time being 25 minutes and the longest "duration of labour" of a woman being more than ten and a half hours. With three and a half hours the median lies noticeably above the mean.

While the period of time between the onset of labour and delivery lasts more than ***five hours on average for women without osteopathic treatment*** the average time for women ***with osteopathic treatment*** is three and a half hours that is ***one and a half hour less***. The difference can be proven with the level of significance of 5%.

It therefore seems that osteopathic treatment leads to a considerable reduction in the average duration of birth.

Perineal injuries (episiotomies and perineal tears) could be observed at half of the women.

On average birth lasts more than seven hours ***from the moment of admission to the hospital until delivery*** with the range of deviation between the shortest and the longest birth in the sample being more than one day. One women took slightly more than one hour to give birth while another woman's child was born after a nearly 30 hour stay in hospital. The median was slightly more than five hours.

On average (both groups) it takes slightly more than one hour ***from the moment of admission to hospital to the transfer to the delivery room***. More than half of the women are transferred to the delivery room after less than half an hour, some women are brought to the delivery room immediately after their arrival in hospital.

There is ***no difference*** in the period of time from admission to hospital to the transfer to the delivery room ***for the two groups***. However, this was expected since this period of time depends on many external factors, which are not connected with the kind of preparation for birth. In both groups this period of time lasts about one hour and 20 minutes.

There are noticeable differences in the means of the ***period of time from the moment of arrival in the delivery room to the start of labour pains.***
On average (both groups) labour starts after one and a half hours in the delivery room, this value also being distorted by "extreme periods". The median of zero hours shows that this period of time is noticeably shorter for most women and that labour has already started when the women arrive in the delivery room.

For the women ***without osteopathic treatment*** (control group) this period of time lasts ***over two hours***, which is nearly ***twice as long as for the test group***. However, there is a strong dispersion in periods of the individual women, which means that the difference, which seems to be obvious at first ***cannot be confirmed with statistical methods***.

As far as the ***total time a woman spends in hospital before her child is born*** is concerned it turns out that in the control group the mean is clearly higher. In the ***control group the mean lies more than two and a half hours above the mean of the women in the test group***. However, the difference cannot be proved with sufficient certainty.

On average the ***control group experienced birth as more painful than the women in the test group*** who are more than one point in the scale below the women in the control group.

When I started this study in 2000, not even a single publication was touching the duration of birth after osteopathic treatment during pregnancy, but recently done studies support my findings.

Lenz (2003) performed a study with 120 pregnant women. She deduced a tendencial significant positive influence onto the course of delivery. The average duration of birth was 5.4 hours for the 60 mothers with osteopathic preparation, whereas birth lasted 8.6 hours for the 60 mothers without preparation. These durations are similar to the total time a woman spends in hospital before her child is born (5.9 and 8.4 hours respectively) and which I have evaluated.

Also Ruspeckhofer (2006) found a shorter duration (9.9 hours for the 36 mothers with osteopathic preparation compared to 11.7 hours without) after osteopathic treatment during pregnancy. Ruspeckhofer stresses the error proneness of evaluating this period, since these data are not the main topic of her study but were only collected in order to gain a more distinct overview about the course of delivery.
Taking all this into consideration the research question underlying the present study can be answered affirmatively.

THE ACTUAL DURATION OF BIRTH – THAT IS THE PERIOD OF TIME FROM THE ONSET OF LABOUR TO THE ACTUAL BIRTH OF THE CHILD - IS NOTICEABLY SHORTER FOR WOMEN WHO HAVE BEEN TREATED ACCORDING TO OSTEOPATHIC METHODS DURING PREGNANCY THAN FOR WOMEN WITHOUT SUCH TREATMENT.

9. CONCLUSION

I have worked out the concept of this study five years ago. Meanwhile I have gained more experience with osteopathic birth preparation because many of my patients are pregnant women who come to my praxis due to complications or pain during pregnancy.
Also now, I consider the same principles as valid which I described in this study.
Nevertheless, additional experiences, which are also very important, influence my way of work on pregnant women:

- ***The mother-child-relationship***, which I try to influence in a positive way by the therapy of the mother's and baby's midlines, a biodynamic cranio-sacral technique.

- ***The respiration***
  During birth preparation I use slight visceral techniques in order to resolve tensions of the diaphragm, if necessary. The diaphragm plays an important role during the birth process: Pain can be reduced by synchronised diaphragmatic breathing during the dilating pains. Also during the pushing period the downward pressure of the diaphragm is important.

  In my opinion, respiration has another important function:

  I consider respiration to be a companion during the whole birth process.

  The parous women can actively support the birth by concentration on and use of the breath and are not only concentrated on the pain. For example, Alman (Alman, B.M., Selbsthypnose, 381) describes natural birth techniques using respiration.

In my opinion, ***the whole course of pregnancy*** influences the parturition due to psycho-emotional factors.
Pregnancy is a very sensible period. The woman's body changes, an embryo grows. The expectant mother encounters many new experiences during this time.

Resulting psycho-emotional factors are influencing the parturition to a high extent (self confidence, letting go,...).

Trust and an ***interaction without frictions*** between the parous woman, the partner, midwife and physician are important, too.

The birth of a child is a very important moment in a woman's life.

Many factors play an important role during the whole process from conception to parturition.

I think, that my part in this process is the preparation of the woman's body for the birth. Additionally, I think, that the osteopathic treatment is also an emotional support for the women.

Many positive reactions of mothers are a motivation for myself to continue (and always improve) my way of working with pregnant women.

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