

Osteopathy for Back and Pelvic Pain in Pregnancy

**Undergraduate Project for the Diploma of the Wiener Schule für
Osteopathie (WSO)**

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CONTENTS

CONTENTS

1. INTRODUCTION	6
2. FOUNDATIONS	8
2.1. PHYSIOLOGICAL CHANGES IN PREGNANCY	8
2.1.1. Maternal weight gain	8
2.1.2. Uterus	8
2.1.3. Postural Changes	9
2.1.4. Joint Laxity Due to Hormonal Changes	10
2.1.5. Changes of the Respiratory Function	10
2.2. ANATOMY	11
2.2.1 The Bony Pelvis and it's Articular Connections	11
2.2.2. Soft Tissue Elements of the Functional Abdominal and Pelvic Space	13
2.2.3. Innervation of the Female Pelvis	14
2.2.4. Suspension and Support of the Uterus	16
3. REVIEW OF RELEVANT LITERATURE	17
3.1.THE CHARACTER OF PAIN	17
3.2. DIAGNOSTIC INSTRUMENTS FOR PPPP	18
3.3. ETIOLOGY OF BACK-AND PELVIC PAIN IN PREGNANCY	19
3.3.1. Pregnancy Affects Ligaments and Bones	19
3.3.2. Pressure on Nerve Roots	21
3.3.3. Increase of the Lumbar Lordosis	21
3.3.4. Biomechanical Factors	22
3.3.5. Hormonal Effects	23
3.3.6. Increase of Body Fluids	23
3.3.7. Philosophy	23
3.3.8. Factors that Do Not Correlate with Back Pain in Pregnancy	24
4. OSTEOPATHIC BASE	25
4.1. OSTEOPATHIC PHILOSOPHY	25
4.2. OSTEOPATHIC PRINCIPLES	25

CONTENTS

5. OSTEOPATHIC CONSIDERATIONS FOR THE TREATMENT OF PREGNANT WOMEN	28
5.1. ADAPTATION MECHANISMS	28
5.2. FUNCTIONAL UNITS.....	30
5.3. THE SPECIAL ROLE OF THE PELVIC AND THORACIC DIAPHRAGM	31
5.3.1. The Thoracoabdominal Diaphragm	31
5.3.2. The Perineum	32
5.4. REFLECTORIC CONNECTIONS OF THE VERTEBRAL SEGMENTS	33
5.5. INFLUENCE ON THE CRANIOSACRAL SYSTEM	33
5.6. IMPROVEMENT OF BODY PERCEPTION	34
6. METHODOLOGY	35
6.1. STUDY POPULATION	35
6.2. INCLUSION- AND EXCLUSION CRITERIA	35
6.3. INTERVENTIONS	36
6.4. MEASUREMENT OF EFFECT	37
6.5. EVALUATION METHOD	38
7. ANALYSIS OF OUTCOME MEASURES	39
7.1. RELEVANT BASELINE CHARACTERISTICS	39
7.2. PHYSICAL DISABILITY	41
7.3. PAIN INTENSITY	42
7.4. CORRELATION BETWEEN THE DISABILITY QUESTIONNAIRE AND THE VAS	43
8. RESULTS OF THE OSTEOPATHIC EXAMINATION AND TREATMENT ...	44
8.1. STRUCTURAL PELVIC REGION	44
8.2. THORACIC DIAPHRAGM	46
8.3. CRANIOSACRAL SYSTEM	46

CONTENTS

9. DISCUSSION	47
9.1. CONCLUSION	47
9.2. COMMENTS ON THE STUDY DESIGN	49
9.2.1. Study Population	49
9.2.2. Intervention	50
9.2.3. Measurement of Effect	51
9.3. OUTLOOK	51
10. ABSTRACT	52
11. LIST OF FIGURES	53
12. BIBLIOGRAPHY	54
13. APPENDIX	57
CONSENT	58
CASE HISTORY	59
EXAMINATION	61
PROTOCOL OF TREATMENT	62
RECRUITMENT OF PROBANDS	63
QUESTIONNAIRE OF THE CONTROLGROUP	64
ROLAND MORRIS QUESTIONNAIRE	65
VISUAL PAIN SCALE	66

1. INTRODUCTION

Back- and pelvic pain constitutes a well-known phenomenon during pregnancy. Almost all studies on this subject have reached roughly the same conclusion: Approximately **50% of all pregnant women** suffer from back- and pelvic pain sometime during pregnancy, 9-15% even severely¹.

All the more surprising is the fact that this subject is being more or less ignored in gynecological and obstetric literature.

It is not hard to conceive that back pain is very unpleasant for a pregnant woman, who is already incapacitated by the increasing abdominal circumference. Unfavourable static circumstances, a deterioration of the psychological situation as well as neuro-chemical changes caused by the pain may also have **effects on the foetus**.

Apart from this obvious reason for the importance of the issue, there are still numerous arguments to be taken into consideration:

Retrospective studies of women with chronic back pain showed that, for 10-28% of the women, the first occurrence of the pain came during pregnancy.² This means that the problems can be **chronified** after pregnancy which probably could be prevented by prompt response and diagnose.

As this study will show later on, pain in the lower lumbar spine and the pelvis is connected with considerable dysbalance in the muscular and ligamentary systems. These, on the other hand, can effect the birthing process negatively and lead to increased need for appliances (forceps, ventouse and Caesarean) as well as a higher rate of episiotomies.³ The conclusion would be that early treatment of back- and pelvic pain can eliminate these dysbalances and **prevent birth complications**.

Furthermore, studies found significant association between back pain in pregnancy and back pain during labor.⁴

In times of cost cuttings the focus is increasingly put on the **financial factor**. A Swedish study found that 70% of all pregnant women in Sweden went on sick leave during pregnancy. The unspecific „back pain“ was the most frequent diagnose and the average length of the sick leave was 9 (!) weeks.⁵ This trend is probably similar in other western wellfair states like Austria.

In this comparing study pregnant women who suffer from pain in the lower back or pelvis (with or without radiation into the legs) will be osteopathically examined and treated. These are compared to a control group of women with similar symptoms. The control group receive treatment in their own or their doctor's estimation, such as bed rest, massage, acupuncture or no intervention.

Thus the osteopathic treatment is compared to the standard treatment as at present given for these problems.

¹ Mens 1996

² Ostgaard 1992

³ Ruspeckhofer 2001

⁴ Diakow 1991

⁵ Mens 2001

In conversations with gynecologists as well as with pregnant women it was apparent that back- and pelvic pain was simply accepted as a disagreeable but unavoidable evil that come with pregnancy just as heart burn and swollen legs.

*"The routine treatment of back pain during pregnancy is sick leave, although there is no scientific proof that sick leave has any impact on the development of back pain during or after pregnancy. Few studies have focused on a solution of the problem and suggestions of specific treatment or prophylaxis is scarce in the literature."*¹

So further research but also information for pregnant women and their gynecologists seem to be very important.

With this paper I hope to promote **a very important and necessary development of the treatment** of back- and pelvic pain during pregnancy and perhaps encourage continuous studies and research.

*"... it seems that back- and pelvic pain in pregnant women is different to other forms. Therefore it should not be treated as low back pain or sciatica. On the contrary, women with these symptoms may have worse symptoms if treated with back- strengthening exercise."*²

This important knowledge should be taken into account seriously by all professional groups (physicians, masseurs, physiotherapists, non-medical practitioners and osteopaths etc.). The following pages may make a modest contribution to the problematic situation of pregnant women.

My personal motivation was also to make osteopathy more known to my immediate environment and to document its importance, consolidation and effectiveness.

¹ Noren 1997

² Ostgaard 1994

2. FOUNDATIONS

2.1. PHYSIOLOGICAL CHANGES IN PREGNANCY

Osteopathic management of an obstetric patient requires knowledge of the normal processes of maternal adaptation. As in all mammalian species, extensive biochemical, physiological and structural changes take place during pregnancy and puerperium. However, the special interest of this study lies in a clear understanding of the effects on the maternal structural framework and possible somatic dysfunctions in normal pregnancy.

2.1.1. Maternal Weight Gain

Of the physical changes that occur, the most obvious are the enlargement of the abdomen and the increase in body weight. The average weight gain for the whole pregnancy is 10-12 kg. Acute excessive weight gain is commonly associated with abnormal fluid retention. The maternal weight gain is a result of an increase in body fat, the mammary and uterine growth and an expansion of blood volume and extracellular fluid (ECF). Additionally, foetal factors such as foetal weight, amniotic fluid and the placenta contribute to the weight gain.

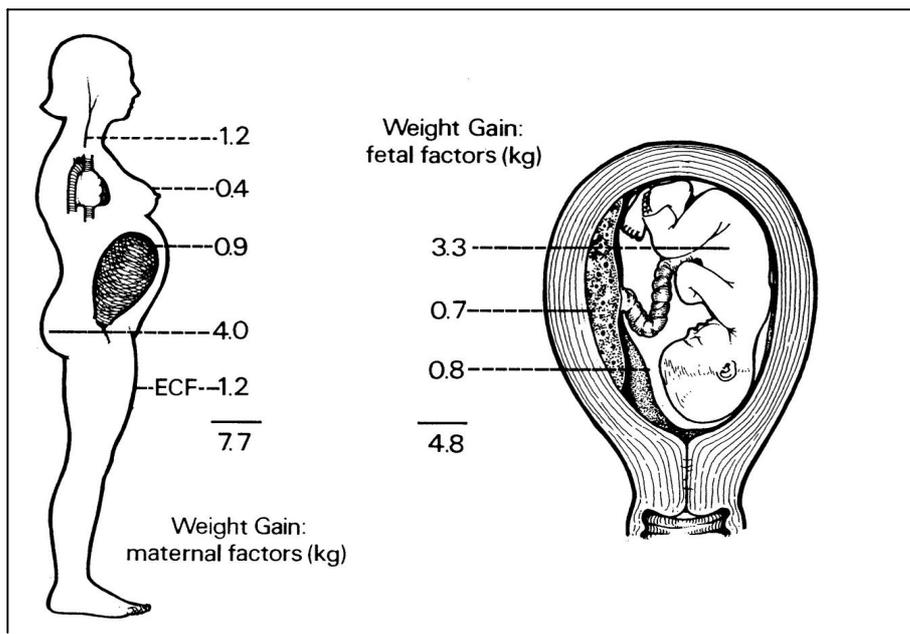


Fig.1: Maternal and Foetal Contributions to Weight Gain at Term

2.1.2. Uterus

During pregnancy the uterus undergoes a 20-fold increase in weight from 50g to 1100 g at term. It grows from 7cm to a length of 30cm and the cavity expands from some 4 ml to 4000 ml!

The uterus consists of bundles of smooth muscle cells separated by thin sheets of connective tissue. Myometrial growth is almost entirely due to muscle hypertrophy, although some hyperplasia may also occur. The stimulus for myometrial growth and development is derived from the direct effects of the growing conceptus and from the effect of oestrogens and progesterone produced by the ovary and the placenta.

The muscle cells are arranged in three layers with muscle bundles running in longitudinal and circular directions and in spiral lines. Through this construction the uterus can optimally adapt to the growing volume without stress or mistimed contractions.

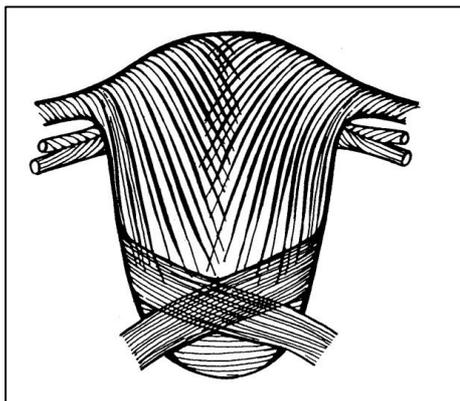


Fig. 2 : Muscle Fibres in the Various Layers of the Human Uterus .

Due to these changes, an adaption of blood supply is necessary. Hypertrophy of blood vessels and increased uterine blood flow associated with increased oxygen consumption in both the uterus and the utero-placental bed take place.

2.1.3. Postural Changes

Due to the enlarging uterus and the growing foetus, the pelvis assumes a new angle to support the weight and volume of the growing foetus. The center of gravity usually shifts forward and a nutation of the sacrum takes place. Probably the lumbar spine assumes an increased lordotic posture.

The paraspinal muscles shorten posteriorly and are unbalanced by overstretching abdominal muscles anteriorly.

The consequences of the shift of the mother's center of gravity will be discussed later in this paper.

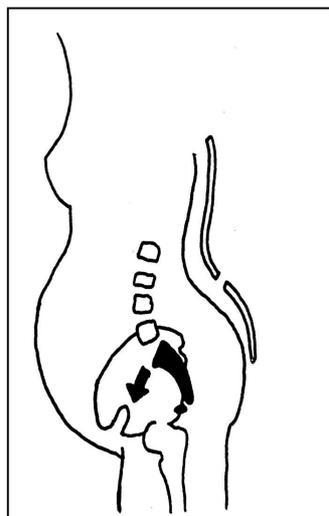


Fig. 3: Nutation of the Sacrum

2.1.4. Joint Laxity due to Hormonal Changes

During pregnancy, alterations in hormonal levels cause physical changes in many parameters. One of them is the widening and increased mobility of sacroiliac joints and the symphysis pubis, which begins around the 10th week of pregnancy. Radiographically it can be detected as early as the first trimester and becomes maximum near term. The hormone **relaxin** has been identified as a major contributor to these changes in joint laxity during pregnancy. Relaxin is secreted by the corpus luteum of pregnancy (*Corpus luteum graviditatis*). Primary target tissues are the cervix, the uterus, and the ligamentous structures of the pelvis. Relaxin promotes relaxation of the articulations of the pelvis in preparation for the passage of the foetus during the birthing process.

Concentration of relaxin elevates during the first trimester and declines early in the second trimester to a level that remains stable throughout the rest of the pregnancy.

During pregnancy the hypophysis has to expand by 50 % due to increased production of corticotrophin, thyrotropin and growth hormones.

2.1.5. Changes of the Respiratory Function

Another important change during pregnancy, which is related to the hormonal alterations, occurs in the respiratory system. There are relatively large changes in the mechanical configuration of the thoracic cage, most of which occur before the uterus enlarges sufficiently to account for such an increase.

These changes are usually attributed to the effects of higher levels of circulating **progesterone** in pregnancy, but relaxin may also play an important role.

The level of the diaphragm rises, and the intercostal angle increases from 68° in early pregnancy to 103 ° in late pregnancy and, because of these changes, breathing tends to be diaphragmatic rather than costal.

Respiratory rate does not change during pregnancy, whereas tidal volume, a measurement of the volume of gas inspired and expired in each respiration, does rise by approximately 40%. This leads to a similar increase in minute ventilation because the respiratory rate is essentially constant.

Bibliography:

E. Malcolm Symonds, Ian M. Symonds "Essential Obstetrics and Gynaecology"
American Osteopathic Association "Foundations for Osteopathic Medicine"

2.2. ANATOMY

The fundamentals of osteopathic thinking and treatment are always the anatomical structures and their function. The intention of this chapter is to give a short survey of anatomical structures that are connected with the issue, especially for readers who are not in a medical profession.

2.2.1 The Bony Pelvis and its Articular Connections

The pelvis consists of three bones and three joints forming an open ring shape. The two innominates are jointed anteriorly by the symphysis pubis and posteriorly by the sacrum via bilateral sacroiliac joints.

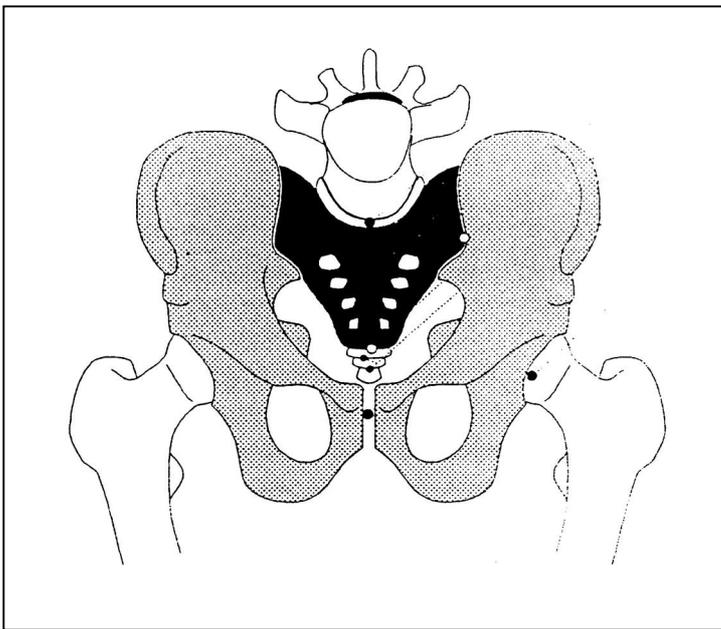


Fig. 4: The Bony Pelvis

The symphysis pubis is a fibrocartilaginous joint that has motion determined by its anatomical shape, ligaments, and muscular attachments. Muscular forces acting on each pubic ramus can cause a symphyseal shear.

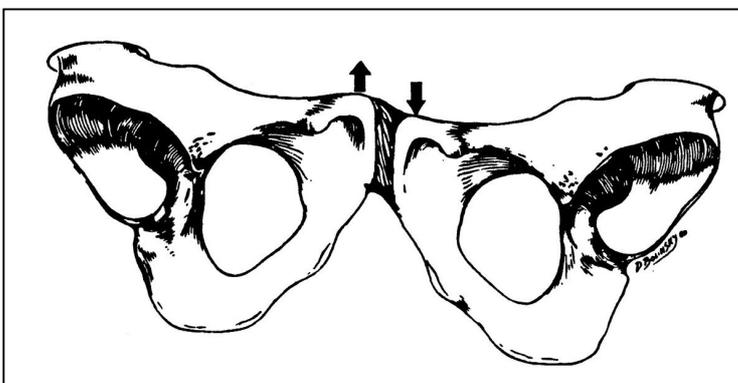


Fig. 5: Symphyseal Shear

The sacroiliac joints have been described as L-shaped. Much variation exists between anatomical descriptions and individual patients' anatomy.

The sacrum between the innominate bones is shaped like an inverted triangle with an concave anterior surface and a convex posterior side. The coccyx attaches to the sacral apex via the sacrococcygeal joint.

The sacrum is attached to the lumbar vertebrae by a lumbosacral disc, two lumbosacral joints and ligaments.

The acetabulum occupies the lateral aspect of the ilium and articulates with the head of the femur to create the hip joint.

Functionally, each innominate bone can be viewed as a lower extremity bone; and the sacrum, as a component part of the vertebral axis.

The pelvic ring has to be able to integrate descending forces coming from the feet and ascending forces from above. Gravity and the ascending force is absorbed to 70% by the innominate, 25% by the pelvic diaphragm and 5% by the spincter system!¹ The symphysis pubis also acts as an important anti-shock pad.

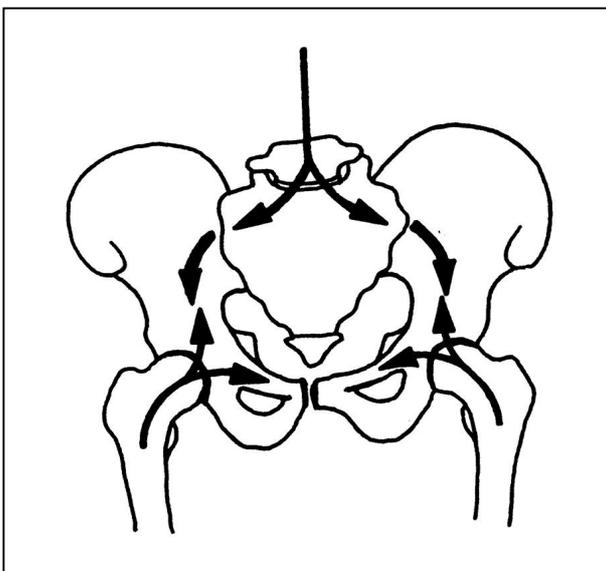


Fig.6: Ascending and Descending Forces

A great number of **ligaments** connect all these bones and joints. They play an important role for the stability of the pelvis. Anterior movement of the sacrum within the pelvic bones is restrained by the sacrospinous and sacrotuberous ligaments. Posterior, lateral and axial rotation movements are restrained by the anterior, posterior and interosseous ligaments. There are no special muscles responsible for the movement of the sacroiliac joints. Motion at the sacroiliac joints is a result of actions by back and leg moving muscles.

In the weight-bearing position, without strong pelvic ligaments, the sacral base would tend to rock anteriorly. In the special situation of pregnancy, the downward effects of gravity, the forward shift of the point of gravity and the hormonal changes can stress the tensile strength of these ligaments.

¹ Molinari 1997

2.2.2. Soft Tissue Elements of the Functional Abdominal and Pelvic Space

The cephalad and partly posterior bound is formed by the **thoracic diaphragm**.

It is attached to the xiphoid process, the lower six ribs, and by the crura to the upper three lumbar vertebrae on the right and the upper two vertebrae on the left side.

It is the primary muscle for respiration. When the diaphragm contracts with inhalation it descends into the abdomen; when it relaxes during exhalation it moves upwards into the thorax.

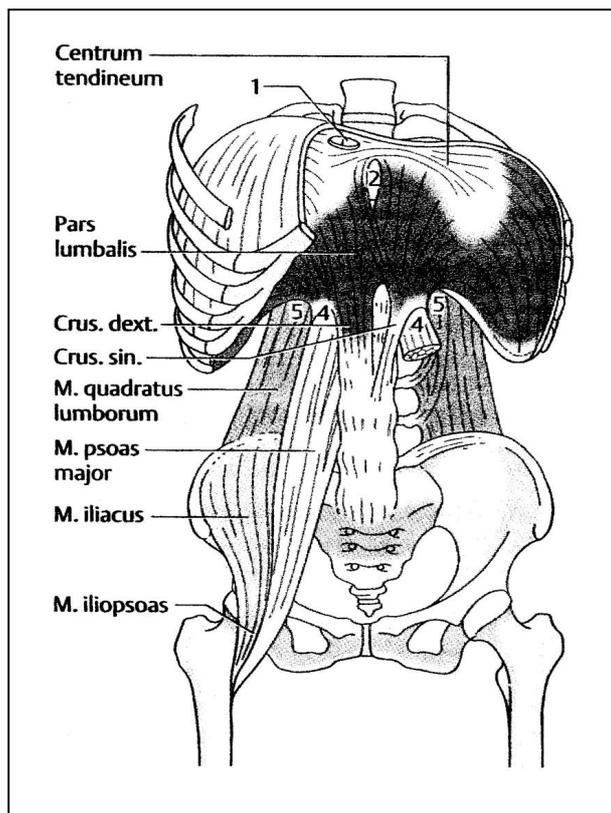


Fig. 7: The Diaphragma Thoracalis

The ventral and lateral sides are covered by the straight, crossed and oblique **abdominal muscles**. Obviously they get over-stretched and weak by the enlarging uterus.

On the dorsal side the important muscles are the **quadratus lumborum, psoas, iliacus and piriform muscles**.

The **quadratus lumborum muscle** can be clinically and functionally thought of as the posteriorinferior extension of the abdominal diaphragm. The fascia continues anteriorly to attach to the transverse processes and then proceeds further anteriorly to enclose the psoas muscle.

Arising from the T12 - L4 vertebrae and their transverse processes, the **psoas muscle** joins the **iliacus muscle** from the inner surface of the ilium and inserts by a common tendon into the lesser trochanter of the femur. The lumbar plexus (lumbar nerve roots L1-4) forms within the belly of the psoas muscle.

The **piriform muscle** originates from the inner side of the sacrum S2-S4 attaching to the greater trochanter. It rounds off the closure of the posterior pelvis and forms the birth channel together with the pelvic muscle floor and the levator ani. A few fibres of the piriform muscle communicate with the anococcygeal ligament leading from the coccygeal bone to the anus. The sacrouterine ligament has its origin on the sacrum similar to the piriform muscle. Dysfunction of a piriform muscle can cause a lesion chain to the corpus uteri and the cervix. Furthermore the piriform muscle influences the position of the sacrum and so the mechanics of the whole pelvis.

Finally, the caudal bounds are the three layers of the **pelvic floor complex which** consists of the pelvic fascia and pelvic diaphragm, and the urogenital anal triangles with superficial and deep genital muscles. The sphincters of the urethra are also included.

The pelvic diaphragm forms the deepest group with the levator ani and coccygeus muscles; it is laterally bordered by the arcus tendineus, the piriform muscle, and the obturator internus muscle.

The sacrotuberal and the sacrospinal ligaments contribute to the dorsal perineum.

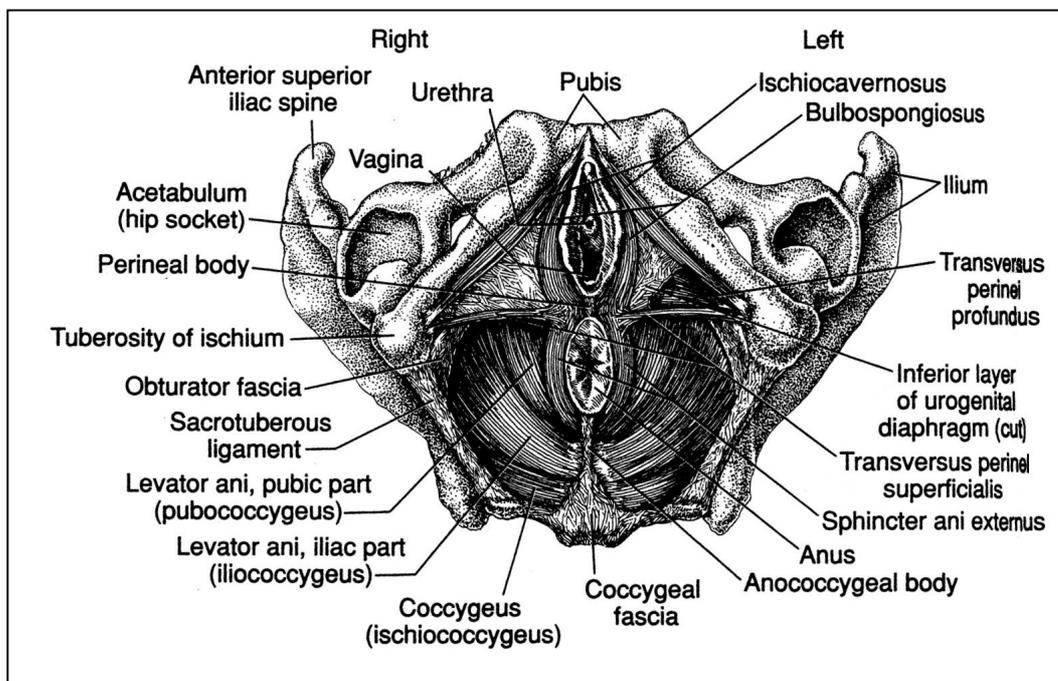


Fig. 8: Pelvic Floor Muscles

2.2.3. Innervation of the Female Pelvis

Sympathetic preganglionic neurons capable of influencing the uterus and cervix are located in the **T10-L2** spinal segments. Postganglionic fibres from these ganglia descend into the pelvic basin coursing in the superior and inferior hypogastric plexus to eventually reach the uterus. Most fibers end on the vasculature of the uterus, some axons terminate in the smooth muscle of the myometrium.

The **parasympathetic** input to the uterus and cervix arises in the spinal segments **S2-4**. These axons target ganglia located in the plexus of Fankenhäuser, a regional subset of the inferior hypogastric plexus.

The number and size of adrenergic nerves appears to increase in the uterus during pregnancy, further suggesting a role for these fibers in the uterine contractions of birth.

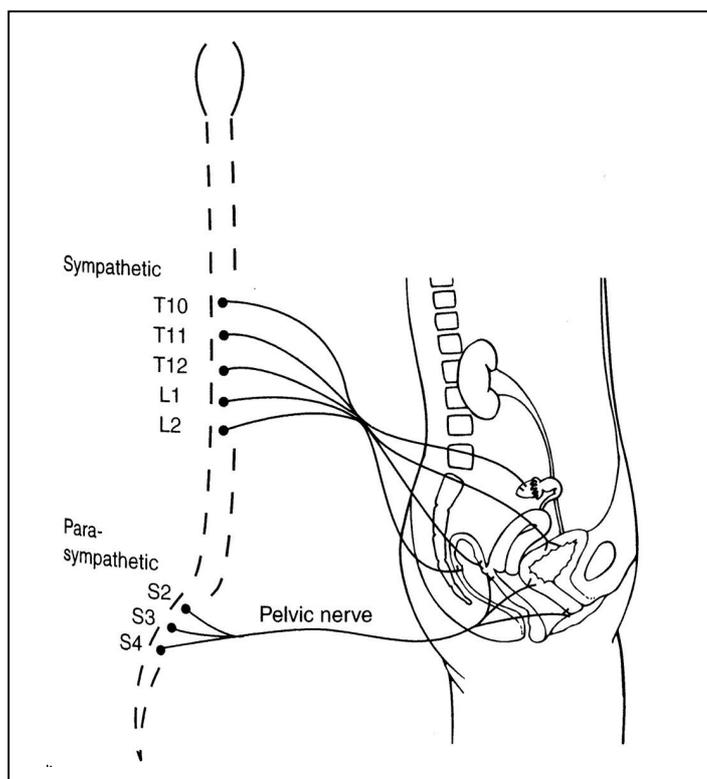


Fig.9: Innervation of the Female Pelvis

The uterus, cervix and vagina receive a complex **afferent innervation**. Experimental studies in cats demonstrate that afferent fibres from the uterus and cervix enter the spinal cord over a range of levels (T12-S3). Clinical studies suggest that the afferent fibers from the human uterus project even higher levels of the spinal cord (T10) and that the majority of pain fibers from the uterus enter the thoracolumbar spinal cord.

Nociceptive fibers from the uterus pass upwards through the superior plexus and lumbar splanchnic nerves to enter the spinal cord over the thoracic and lumbar segments.

The pathways handling sensory information from the female reproductive tract are split. Input from above the cervix ascends through the superior hypogastric plexus to the thoracolumbar junction while afferent fibers from the cervix and below descend into the sacral spinal cord. This arrangement of primary afferent fibers may in part be responsible for the presentation of low back pain in pregnancy.

The afferent as well as the efferent neural connections emphasize the importance of the thoraco-lumbar junction and the sacral area in the osteopathic treatment.

2.2.3. Suspension and Support of the Uterus

On the one hand the uterus has to be very flexible and mobile during pregnancy and it needs to be safe and stable on the other. This is possible through a complex system of various factors.

The **thoracal diaphragm** creates negative pressure which maintains the whole viscera as well as the uterus in position.

The **pelvic peritoneum** covers most of the uterus, especially the fundus. It has only a minor role in suspending the uterus, however. Nevertheless, peritoneal restrictions can seriously disrupt the mobility of the uterus.

The **pelvic floor** constitutes the posterior inferior boundary of the abdominal cavity and supports the uterus from below, together with the **lamina sacro-recto-genito-pubialis**.

Additionally, there is the **uterine ligament suspension**:

The uterus is mainly stabilized in its cervical part by retinacula containing collagene, elastic and smooth muscle fibers: The **pubovesical uterine ligament** extending from the posterior part of the symphyseal rim to the neck of the bladder and to the cervix and the **rectouterine ligament** more dorsally.

The rigid **cardinal ligaments** within the most caudal part of the parametrium permit a guided anterior posterior movement of the uterus.

The strong **sacrouterine ligaments** originate from the S2-4 segments, similar to the piriform muscle. They insert on the posterior side of the corpus uteri, joining the cardinal ligaments. They help to maintain the uterus in position within the pelvis and form the axis of the uterus. They contain the uterine plexus, part of the inferior hypogastric plexus.

The **ligamenta ovarii propria** contain smooth muscle fibers, which attach to the ovaries and connect to the uterine tube angel.

The **ligamenta teretia uteri** or **round ligaments** originate from the lateral side of the fundus uteri and pass by the inguinal channel to the pubic bone. They help the uterus in orientation. On account of their hypertrophy during pregnancy they may cause a sense of inguinal pain. The round ligaments tend to a vertical course towards the end of pregnancy when they are four times longer.

The **ligamentum latum** uteri connect the uterus with the sides of the pelvic wall. They are constituted by two folds of the peritoneal sheath and they have no sustaining function. They partially enclose the tubes as well as the urethra, the uterine ateria and lymphatic vessels.

Bibliography:

B. Ligner D. O. "Viscerale Osteopathie - Uterus" WSO 1997

American Osteopathic Association "Foundations for Osteopathic Medicine"

J-P. Barral "Urogenital Manipulation" 1993

3. REVIEW OF RELEVANT LITERATURE

3.1. THE CHARACTER OF PAIN

Back pain is common in the general population, and pregnancy increases the incidence and adds a **different type of back pain** to the well known lumbar type.

This other type of pain is described by a large group of pregnant women and is located in the posterior part of the pelvis distal and lateral to the lumbosacral junction. The pain radiates to the posterior part of the thigh, may extend below the knee and thus may be misinterpreted as sciatica or posterior joint syndrome. The condition is different from sciatica however; it is less specific than the nerve root syndrome in distribution and does not extend down into the ankle and foot. The pain is different from posterior joint syndrome because it does not emerge from the lumbar area. Furthermore, it does not include muscle weakness or sensory impairment and reflexes are unchanged.¹

For this painful sensation around the pelvic ring, internationally the term "**peri partum pelvic pain**" or "**posterior pelvic pain since pregnancy**" (**both PPPP**) is used. Pregnant women but also women in childbed characterize "their back pain".²

- in the lumbo-sacral area
- around one or both sacroiliac joints
- at the symphysis pubica

These women with pain in the gluteal and posterior thigh region often describe a "catching" feeling of the leg when walking as well. Whereas only 2% with a negative posterior pelvic pain test have this symptom. The most probable explanation for the catching is that local nociception disturbs muscular function in women with posterior pelvic pain because changes in the sacroiliac joint range of motion, which is minimal, cannot cause this symptom.³

A study which compared pregnant women suffering from back pain with women suffering from PPPP⁴ found, that pain intensity was higher among women with posterior pelvic pain during pregnancy, whereas after delivery pain intensity was higher among women with back pain. A correlation was also found between the presence of high pain intensity during pregnancy and little regression after delivery.

The question of how osteopathy influences this correlation would also be interesting!

Pain often radiates to the posterior part of the thigh and may extend below the knee, and thus may be interpreted as sciatica. However, it is less specific than the nerve root syndrome in distribution and does not extend down into the ankle or foot.¹ Additionally, posterior pelvic pain does not include muscle weakness or sensory impairment, and reflexes are unchanged.

True sciatica with a dermatomal distribution occur in only 1% of pregnant women (in a study of 855 women)!⁵

¹ Ostgaard 1994

² Heller 1998

³ Ostgaard 1997

⁴ Ostgaard 1996

⁵ Ostgaard 1991

3.2. DIAGNOSTIC INSTRUMENTS FOR PPPP

Studies showed that pain provocation tests were better at discriminating among women who reported back pain from women who reported no back pain from tests of configuration or mobility.¹

There are two tests which were developed to differentiate between "common" back pain, PPPP and no pain.

Posterior Pelvic Pain Provocation Test:

The test is positive when the supine patient feels a pain while her vertically positioned femur is gently pressed posterior by the examiner who simultaneously stabilizes the woman's pelvis (Figure 10). The patient registers a well-known pain deep in the gluteal area on the provoked side (Figure 11)².

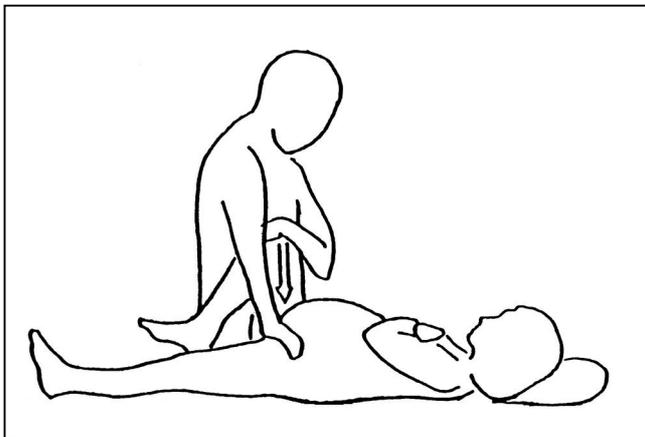


Fig. 10: The posterior pelvic pain provocation test

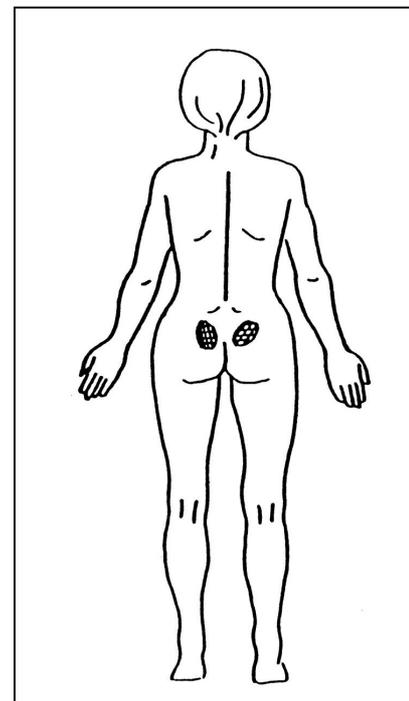


Fig. 11: Areas where the pain is felt when provocation test is performed

Active Straight Leg Raise Test (ASLR):

The ASLR test is another instrument to discriminate between patients who are disabled by posterior pelvic pain and healthy subjects. It is based on the observation of a Swedish gynecologist in 1839, who already described the pain or weakness of pregnant women when they want to raise one or both legs from the supine position. He assessed moreover "... an

¹ Kristiansson 1996

² Ostgaard 1994

instantaneous relief in the pains and the ability to move the limbs when the hips are pressed hard together with the hands".¹

In this test the patient in supine position is asked to raise one leg after the other from the couch for 20cm without bending the knee. Then she is asked if she felt any difficulties or pain; furthermore the velocity of leg raising, the appearance of any tremor in the leg and the amount of rotation of the trunk is observed.²

Both tests are well documented and rated as reliable, sensitive and specific diagnostic instruments to assess PPPP.

Since the correlation between the ASLR test and the PPP provocation test is rather low, it is hypothesized that they measure two different aspects of the phenomenon. So the ASLR test probably measures the decreased function to transfer loads from the legs to the trunk, whereas the posterior pelvic pain test probably shows, whether the system has been overloaded or not during the preceding days or weeks.²²

3.3. ETIOLOGY OF BACK- AND PELVIC PAIN IN PREGNANCY

It remains questionable whether PPPP is a specific syndrome or just nonspecific lumbopelvic pain with an onset during pregnancy. However, there are probably numerous etiologies and even more precipitating factors.

Only a few epidemiologic observational studies have been performed. The majority of studies regarding its cause reflect data taken from patient questionnaires; only few studies have employed a traditional detailed physical examination of patients to diagnose the source of back pain. Nevertheless, it seems to be clear that there are essential differences of the etiology, diagnosis and management of back- and pelvic problems in pregnant women compared with non-pregnant women or men.

In this chapter I have attempted to present a review of the common thoughts and theories I have found in a great number of scientific articles - even though they are controversial in certain fields.

3.3.1. Pregnancy Affects Ligaments and Bones

It is the hormonal changes in pregnancy in particular that lead to increased laxity of ligaments and increased mobility of the pelvic joints.

In earlier literature **the mobility of the sacroiliac joints** was said to be the sole cause of pain in pregnant women. Anatomic studies in former days, when mortality during pregnancy and labour was not an exception, showed increased mobility of the sacroiliac joints; often an increased amount of articular (synovial) fluid was found. Such an increase influences the stability of the sacroiliac joints because in these joints friction is important for stability.³

¹ Mens 2001

² Ostgaard 1994

³ Mens 1996

- This theory is questioned since Sturesson et al¹ showed that there was no difference in mobility among women with symptomatic and asymptomatic sacroiliac joints.

Increased mobility of joints also leads to a **widening of the pubic symphysis**, well documented before the hazard of irradiation were realized.²

Laxity in the pelvic joints in pregnant women is seen as a necessary preparation for delivery. Indeed this change is also confirmed in the study of Östgaard et al, although a **uniform peripheral laxity** was not found in pregnant women.

- An increase was found primarily in primipregnant women, with a weak correlation to back pain. Multiparous women showed an initially higher laxity but less increase during pregnancy and no correlation to back pain in pregnancy. It seems that peripheral laxity does not return to its prepregnancy state after delivery.^{3,4}

If back pain was caused by changes in the **ligament structure**, then it should be effort-related, in accordance with other conditions with tendon overload.

A strong **correlation between back pain and heavy work was reported** by Berg and Östgaard and was substantiated by a clinical observation showing that the intensity of pregnancy related back pain increases during or within hours after a relative overload of the back or pelvis.²

In an anatomical study, **bony pits** have been observed at the attachments of the ligaments in the pelvis in pregnant women but they were not observed in women who were not and had never been pregnant or in men.²

It is not proved whether increased movement in the pelvic joints are related to pain intensity, neither is increased peripheral laxity.⁵

Per Kristiansson suggests in his study that pain may be provoked by several structures, such as the sacrospinal and sacrotuberal ligaments, the sacroiliac ligaments, the iliolumbar ligaments, and possibly others. **These ligaments and surrounding structures are part of a functional system, and it seems reasonable that this functional system rather than individual ligaments is affected.**⁶

It is suggested that problems in the lumbopelvic area are caused by a **disturbed proprioception and decreased function of muscles** because of pain and fatigue.² Especially patients with joint laxity may be vulnerable being trapped in a vicious circle with pain and fatigue, decreased proprioception, decreased muscle function, decreased load transfer between spine and legs, pain and fatigue, etc.⁷

Alternative pain-releasing structures may be the **external rotator muscles** in the pelvis, where pain may have been released by pressure on the sacrospinal ligament area.

¹ Kristiansson 1996

² Mens 1996

³ Ostgaard 1993

⁴ Andersson 1993

⁵ Ostgaard 1994

⁶ Kristiansson 1996

⁷ Mens 2001

- However, this idea is contradicted in Kristiansson's study by the lack of a significant relationship between test results for tender sacrospinous ligaments and test results showing painful passive movement of the ipsilateral hip.¹

A Swedish study of 482 pregnant women found that **physical fitness exercise before pregnancy** reduced the risk of developing back pain in pregnancy, whereas women with posterior pelvic pain did not benefit.²

3.3.2. Pressure on Nerve Roots

Radicular symptoms often accompany low back pain discomfort in pregnancy. Despite increased shear placed across the disc space, herniated nucleus pulposus during pregnancy is uncommon, having an incidence of only 1:10 000.³

It has been postulated that direct pressure on nerve roots or plexi **by the gravid uterus** is responsible for many of the radicular symptoms.

Bushnell in 1949 proposed that mechanical pressure **of ligamentous structures** of the spine on nerve roots (resulting from increased lordosis of pregnancy) was responsible for radicular pain in pregnancy.

The symptoms are primarily parasthesias in the distribution of the ilioinguinal and iliofemoral nerves.³

In the final four weeks of pregnancy, when the foetus settles into the pelvis, some women experience radicular symptoms. These have also been distributed to direct pressure of the gravid uterus on components of the lumbosacral plexus that coalesce into the sciatic nerve.

- A study using magnetic resonance imaging demonstrated that bulges or herniations of lumbosacral discs are common in women of childbearing age and that pregnant women do not have an increased prevalence of disc abnormalities.³

3.3.3. Increase of the Lumbar Lordosis

The idea that an increased lordotic position during pregnancy is responsible for back- or pelvic pain is persistent. The altered posture causes stress across the vertebral facets of the lumbar spine and increased shear forces across the vertebral disc spaces.

- However, radiographic studies have not verified this idea.³
- Others used an inclinometer to measure the progression of kyphosis, lordosis and pelvic tilt, even though they did find small degrees of increase, it did not correlate to the development of back pain symptoms in their study group.⁴

¹ Kristiansson 1996

² Ostgaard 1994

³ Ward 2003

⁴ Franklin ME, Conner-Kerr T. 1998

- Snijder et al. studied 16 pregnant women and measured the curves of the spine just before birth and after birth. In most women, lordosis was less during pregnancy than postpartum!^{1,2}
- Moreover, the lumbar lordosis does not change from the 12th to the 36th week of gestation. Only an initially large lumbar lordosis turned out to be a risk-factor for back pain in pregnancy.³

3.3.4. Biomechanical Factors

It is still tempting to speculate that complaints arising during pregnancy are, at least in part, caused by **the weight of the foetus and uterus**, altering the load on muscles, tendons and joints.

A Dutch study of 382 pregnant women with pelvic pain showed that their average weight at birth was significantly higher than in the general Dutch population.¹

- Whereas the same study showed that the mean body mass before pregnancy and the increase in weight during pregnancy did not differ from the general population.

Nevertheless many back problems already start in the first months of pregnancy when the weight of the foetus or uterus can hardly have any influence.

Another Swedish study tried to evaluate the influence of some biomechanical factors on back pain during pregnancy.

It followed the development of weight gain, abdominal circumference, sagittal and transversal diameters, the amount of lumbar lordosis, finger laxity (to reflect the increased laxity in the pelvic joints) and striae distensae in the skin of the abdomen, thighs and breasts.

All parameters were related to back pain during pregnancy and the only ones that correlated significantly were **a large sagittal and a large transversal abdominal diameter**.³

This may support the theory that the large flexion moment on the lower back produced by the growing uterus and foetus contributes to the development of back pain. Calculations suggest that the additional loads due to pregnancy are approximately equivalent to the loads that would be imposed on a nonpregnant woman who carried her trunk continuously flexed forward by 22.3 degrees superior to the L3 level.¹

Pregnant women can, in fact, compensate at least in part for the additional flexion moment by counterbalancing it through **extension of the upper trunk and neck**. Since it has been found out that the depth of the lumbar lordosis does not change, pregnant women apparently compensate for the flexion moment by **hip joint extension rather than lumbar spine extension**.¹

¹ Mens 1996

² Ward 2003

³ Ostgaard 1993

3.3.5. Hormonal Effects

The hormone relaxin is responsible for the changes in joint laxity during pregnancy. Mac Lennan et al ¹ reported that women who had been incapacitated by low back pain during pregnancy had extremely high levels of the hormone relaxin, suggesting that excessive relaxin is not innocuous.²

Another sign for the **hormonal effects** can be found in the fact that if the pain remains throughout delivery it gets stronger during menstruation and often relapses during a subsequent pregnancy.^{3,4} The frequent relapses are possibly the result of a detrimental hormonal influence after previous pelvic damage. A damaged pelvis might be more sensitive to the influence of hormones.

It is possible that the hormones affect not only the peripheral joints, but decrease the stiffness of the intervertebral discs, thereby causing pain.

➤ This is questioned by others, however.⁵

3.3.6. Increase of Body Fluids

The increase of body fluids for the needs of the foetal development are sometimes accompanied by an insufficient return of the fluid into maternal systemic circulation. This can result in **congestion or edema** of maternal organs and tissues.

Back pain may also be related to development of **varicose veins**.¹ Typically, women complain of night back pain 1-2 hours after lying down. When they lie down at night, the changes in osmotic forces allow some of the fluid to return to the intravascular space, resulting in increased venous return. This increased venous return, coupled with venous blockage that occurs by pressure of the foetus on the vena cava, results in decreased blood flow through the pelvis. A delayed, stagnant hypoxia of the neural tissue and the vertebral bodies ensues, producing the delayed low back pain (and sometimes radicular symptoms).

3.3.7. Philosophy

The **teleologic explanation** postulates that pain makes the woman more careful during pregnancy.

¹ Ward 2003

² Russell R, Reynold F 1997

³ Mens 1996

⁴ Brynhildsen 1998

⁵ Russel 1997

3.3.8. Factors that Do Not Correlate with Back Pain in Pregnancy

It is obvious that many factors are associated with the development of any form of low back pain during pregnancy, although most of them are controversial.

The following have not been found to correlate with the development of low back pain syndromes during pregnancy:¹

- Race
- Occupation
- Maternal weight before pregnancy
- Weight gain
- Sleeping posture
- Mattress type
- Shoe heel heights
- Previous epidural anesthesia

¹ Ward 2003

4. OSTEOPATHIC BASE

One of the aims of this study is to present osteopathy as a serious method to those who are unfamiliar with or sceptical about it. My intention with this chapter is to introduce the reader to the basic thoughts on which osteopathy is grounded. Osteopathic treatment is not only an accumulation of manual techniques but has a significant background!

4.1. OSTEOPATHIC PHILOSOPHY

Osteopathic medicine is distinctive in the very fact that it has been and continues to be practiced according to an articulated philosophy.

This philosophy arises from the teachings and writings of **Andrew Taylor Still (1827-1917)**, a medical doctor in the United States.

The four key principles of osteopathic philosophy are as follows:

I. The body is a unit; the person is a unit of body, mind, and spirit.

II. The body is capable of self-regulation, self-healing, and health maintenance.

III. Structure and function are reciprocally interrelated

IV. Rational treatment is based upon an understanding of the basic principles of body unity, self-regulation and the interrelationship of structure and function

4.2. OSTEOPATHIC PRINCIPLES

Osteopathy is an independent medical method, using **the hands of the therapist** for diagnose and treatment on the basis of precise knowledge of anatomy and physiology.

The osteopathic principles closely follow the philosophical thoughts which are the basis of every osteopathical treatment.

1. Motion is Life

In osteopathic terminology a joint is a connection between two adjacent anatomical structures and these joints are always in motion.

The anatomical structures may be two bones but also an organ and a muscle, a fascia and a muscle, or two organs.

A restriction of motion is called a lesion.

2. The Interaction between Structure and Function

A person is regulated, coordinated, and integrated through the interdependent functions of multiply associated anatomical, physiological and psychological systems.

Anatomically, all body structures are enveloped in connective tissue or fascia, making them continuous and mechanically interdependent. Physiologically, synergy of body function is facilitated by the nervous and circulatory systems, which enable communication and interaction among the various body systems.

When a thrust, a trauma or other external forces disturb the structure, the function is also affected. The reverse occurrence is also possible; a long-lasting dysfunction may disturb the structure.

Osteopathy is based on the following two fundamental sciences, anatomy (= structure) and physiology (=function).

3. The Body Functions as a Unit

A body both healthy and sick has to be seen as a biological unit. If there is a disorder in the organism - a dysfunction - it will affect the entire individual.

The following interactions are central in osteopathy:

- the parietal system
- the visceral system
- the cranio-sacral system

Osteopathic therapy attempts to improve and reinstate lost motion physiology of all structures. This has a positive influence on all other physiological functions as well. The aim is to reinstate the entire physiology, the entire function, the homeostasy!

4. The Rule of Supply

Two structural entities, arteries and nerves, are vital for the health and maintainance of any organ or area.

Arteries supply their distribution areas with nutrients, oxygen and a variety of hormonal regulatory substances. Adequate blood supply is prerequisite for the health of an organ or an area. Conversely, impaired blood supply often leads to diminished functional capacity, cascading and consequently disease.

Nerves provide a continuous neural control of skeletal and smooth muscles as well as of glandular tissue and deliver trophic or regulatory factors to the muscles or organs that they innervate.

Therefore one of the aims of an osteopathic approach is to recognize what part of the surrounding tissue might compress a specific artery or nerve.

Another important rule is of course "the rule of drainage". There are two pathways for the removal of fluids and blood cells from an area; the venous network and the lymphatic channels

5. The Principle of Autocorrection and Autoregulation

The human body is provided with a specific defence- and alarm system.

This system comprises several mechanisms:

- the immun system

A compound of many different systems, e.g. body fluids, skin and muscous membranes, thymus and tonsils, liver, spleen, appendix, fascia, ...

- the nervous system

- the re-establishing function

The body can repair tissues that have been damaged by traumas, viral infections, the environment etc..

- compensation

If these systems can work optimally, the body provides the ability of self-healing.

An osteopath attempts to perceive the interrelations between these different structures in order to let them function regularly again. His or her **aim is** to disperse or weaken the causes of disease, to re-establish the motion of joints and fascia, to normalise the interchanging processes of the entire body fluid, to coordinate the bioelectrical phenomena, to balance the autonomic nervous system, to harmonise the body statics, to disperse visceral disorders, to support and regulate the nourishing body elements, to deepen the breath, relaxation, toning, to strengthen the the body's own immune system and to encourage its own healing potential to express itself - to heal itself.

Bibliography:

Foundations for Osteopathic Medicine: pp. 3-15 Osteopathic Philosophy

pp. 27-45 Rules of Anatomy

Peeters, Lason: Das Becken

pp. 35-57 Osteopathische Prinzipien

Ligner Bernard: personal notes at the WSO

5. OSTEOPATHIC CONSIDERATIONS FOR THE TREATMENT OF PREGNANT WOMEN

The search for literature on the Internet (PubMed, DIMDI, PEDRO, BMJ and others) did not result in many relevant articles on osteopathy. However those I found mainly discussed foundations of orthodox medicine. Those really dealing with osteopathic treatment were of S. Sandler, Director of *The Expectant Mother's Clinic* of the British School of Osteopathy in London. Furthermore M. Tettamble discussed in the chapter 'Obstetrics' of the "Foundations of Osteopathic Medicine" some clear considerations of the osteopathic approach to this issue.

This chapter is an attempt to correlate the special circumstances of a pregnancy with the general approach of osteopathic treatment strategies. During pregnancy changes take place on different levels, all of which can release back and pelvic pain. Accordingly, the links to osteopathy are diverse and complex.

5.1. ADAPTATION MECHANISMS

Even though a pregnancy is not a state of illness it is still a drastic change of the female body, however temporary. The adaptability of the body is crucial for a smooth pregnancy. The better a woman can adjust to the changed condition the fewer problems she will have in the back and pelvic areas.

Fundamental Postural Considerations :

At the end of pregnancy, 75% of patients will have a posterior posture with a posterior carriage where weight falls behind normal anterior/posterior centre of gravityline. 25% will have an anterior posture with an anterior carriage where the weight stays on the vertebral bodies or the discs.¹

So the posture of a pregnant woman is mostly comparable to the posture of the posterior type and the same muscles and ligaments are activated. As this posture is necessary on the one hand but temporary on the other the attention will mainly be focused on the adaptability of muscles and ligaments during pregnancy. Problems arise when those can not adapt accordingly which means that it will be difficult to integrate the growing uterus in the body as a whole and to remain in balance.

The following muscles usually get tight or spastic with a posterior postural pattern:²

- Erector spinae mass
- Quadratus lumborum muscle
- Iliopsoas muscle
- Piriform muscle
- Hamstrings
- Tensor fasciae latae muscle
- Hipp adductor muscles (short adductors)
- Gastrocnemius and Soleus muscle

¹ Sandler 1996

² Ward 2003

It is important to examine the functionability and adaptability of the muscles listed above in pregnant women as well.

A previous history of low back pain, or a postural problem, which the body has been able to cope with until now, will be aggravated by the increased weight-bearing and softening of the ligaments that occur during pregnancy.¹

A compensated posture is the result of the patient's homeostatic mechanisms working through the entire body unit to maximize function. Whereas decompensation occurs when an individual's homeostatic mechanisms are overwhelmed.¹

Further factors that control which sort of posture the subject might develop include the following:²

- The patient's morphology: Taller, thinner women are more prone to developing an anterior posture and shorter, fatter women a lordosis.
- The pre- pregnancy state and fitness.
- The relative weight and size of the developing foetus compared to the available abdominal space.
- The integrity of the abdominal muscles. Scar tissue from previous abdominal operations might resist to stretching. On the other hand, if a patient has had several children in a short space of time her abdominal muscles are more likely to have lost tone and thus not support the weight of the growing foetus. This could lead to the establishment of the lordosis too early with all the attendant problems.

The postural compensations in the spine occurs most commonly in the so called "transition zones", areas where anatomical structure changes create a potential for the greatest functional change. These transition zones are the occipitocervical junction, cervicothoracic junction, thoracolumbar junction and lumbosacral junction.¹

Pubalgia or in severe cases a diastasis of the pubis may be caused by an **anterior posture** when the weight falls on the pubic symphysis.²

The studies of the biomechanical factors show that women usually compensate the additional weight by extension of the hip joints and extension of the upper trunk and neck.³

This means, however, that these areas have to be extensionable! Osteopathy always tries to consider the whole body and treatment often takes place far away from symptoms or pain. So it may be necessary to work on other areas than the lower back and pelvis although women suffer from pain here.

¹ Montague 1985

² Sandler 1996

³ Östgaard 1992

Optimal posture is defined as "a balanced configuration of the body with respect to gravity".¹ The presence of an optimum posture suggests that there is a perfect distribution of the body mass around the center of gravity. This should also be the aim for pregnant women.

In order to reach maximum function and reaction of the neuromusculoskeletal system the considerations listed above must be integrated in examinations and treatment schedules for pregnant women.

5.2. FUNCTIONAL UNITS

Of course, the speculations about irritated ligaments around the pelvis, as the sacrospinous, sacrotuberous, iliolumbar sacroiliac and others, will attract much attention.

"These ligaments and surrounding structures are part of a functional system, and it seems reasonable that the functional system rather than individual ligaments is affected".² This statement in Kristiansson's study appears to me to be a real osteopathic conception even though Kristiansson is not an osteopath.

At this point it is time to consider what this functional system contains:

- Postural imbalance or diminished homeostatic abilities to resist gravity functionally stresses ligaments. These ligaments include the iliolumbar, sacrotuberous, and long dorsal sacroiliac ligaments:¹
 - The iliolumbar ligaments are critical structures for stabilizing the lumbar vertebrae on the sacral base. They are usually the first structures to be involved with postural decompensation and are affected by both sacral and innominate rotation. Functional changes include tenderness, edema, and pain referred to the lower extremity.
 - The sacrotuberous ligament and the long dorsal sacroiliac ligament respectively resist anterior and posterior rotation of the sacrum.

Postural stress involves complex biomechanical interaction between these ligaments, the sacroiliac joint, the thoracolumbar fascia, and a variety of muscles.³

- Additional to the osseous connections in and around the pelvis and the ligaments mentioned above, the ligamentary structures embedding the uterus are a part of this functional system.
- Further, several muscles are directly connected to this functional system, such as the iliopsoas muscle, the piriformis muscle and the short external rotators in the pelvis (obturatorius internus and externus), as well as the pelvic floor muscles as the lower limit and the thoracic diaphragm as the upper.

¹ Ward 2003

² Kristiansson 1996

³ Vleeming 1996

- Comparable to a transmission belt the iliopsoas muscle constitutes the connection between the thoracolumbal junction, the lumbar vertebrae, the pelvis, the hip, the intestines and the kidneys.¹

The psoas muscle is also regarded as an important guard rail for the growing uterus. Furthermore it should also be kept in mind that a tight psoas may lead to a lock of the lumbar vertebrae and especially of the thoracolumbal junction.

All mentioned structures must remain in symmetry and interact optimally even under changed circumstances. The connections between these structures have already been described in the chapter on anatomy.

Strengthening the muscles to support the painful ligaments, e.g. the internal pelvic muscles and the gluteus maximus, as proposed by Vleeming et al might also be helpful.²

A recent study shows the connection between the abdominal muscles with transversely orientated fibres and laxity of the sacroiliac joints.³ Obviously most of the transverse abdominal muscles cannot work efficiently in pregnant women, however contraction of the pelvic floor muscles (e.g. the coccygeus muscle) can stabilize the pelvic region.

5.3. THE SPECIAL ROLE OF THE PELVIC AND THORACIC DIAPHRAGMS

The pelvic and thoracic diaphragms play an important part in the body not only generally but especially during pregnancy. Therefore they are given special attention here.

They constitute the upper and lower limits for the functional abdominal cavity of the growing uterus and the demands on them are manifold.

5.3.1. The Thoracoabdominal Diaphragm

The thoracoabdominal diaphragm is attached to the xiphoid process, the lower six ribs, and the upper three lumbar vertebrae, so diaphragmatic tension may be produced by specific joint somatic dysfunction but also by fascial pull or torsion at the thoracolumbal junction.

The up and down movements produce pressure gradients between the thoracic and abdominal cavities and are important for both efficient respiration and circulation. Because there are one-way valves in the larger lymphatic vessels, the pressure gradients also enhance the movement of lymph and venous blood toward the heart. When the dome of the diaphragm is flattened because of asymmetrical load and/or tonus, respiration and lymphatic drainage from anywhere in the body becomes less efficient, which is an important aspect especially during pregnancy.

The intercostal angle changes when the uterus grows [see 2.1.5]. Depending on the position of the foetus different pressure conditions are detectable.

¹ Schmutz 1996

² Vleeming 1992

³ Richardson 2002

As described earlier the supradiaphragmatic pressure is lower than the subdiaphragmatic pressure, so that the contents of the abdominal cavity are in effect suspended from the diaphragm. The force of gravity in the abdominal cavity acts against this upward force. The weight of the organs is effectively diminished by this attraction effect created by pressure differentials.¹ Even if the position of the organs change somewhat during pregnancy this basic consideration is still valid. Basically, the uterus is more supported than suspended¹ although it continuously pushes cranially towards the diaphragm with progressing pregnancy. Therefore, in my point of view, this effect becomes significant with increasing size and especially weight.

5.3.2. The Perineum

The perineum is a group of soft tissues which shut the pelvic outlet off from the outside. It has two conflicting roles: to form a solid floor and to open periodically to allow expulsions. The pelvic organs rest upon the perineal floor. The floor must be able to alleviate these permanent pressures and also to compensate for the transient or temporary increased pressures produced by coughing, sneezing, hiccups, pregnancy, etc. In other words, it has to be elastic.² During pregnancy the perineum is exposed to a maximum of both demands.

Bilateral relaxation of the pelvic diaphragm permits it to hold the growing pressure in pregnancy and also to work in concert with the thoracoabdominal diaphragm. Parallel motion of these diaphragms improves lymphatic flow from the pelvic organs in particular, and the flow of lymph through the thoracic duct in general.

Asymmetry in tension and motion of the pelvic diaphragm can hold other structural and ligamental pelvic problems and vice versa.

Moreover, the two diaphragms, together with the thoracic inlet and the tentorium, form the so called „transversally restrictive diaphragms“³. These are the transversal supports of the longitudinal fascian tractions of the whole body. A certain amount of longitudinal motion is characteristic for this fascian formation. The diaphragms are often exposed to extreme pressure and are predilection areas for dysfunctions in the longitudinal motion and the cranio-sacral system. Therefore hypertonus and asymmetries should be regarded and treated from this point of view as well.

¹ Barral 1995

² Barral 1995

³ Upledger 1991

5.4. REFLECTORIC CONNECTIONS OF THE VERTEBRAL SEGMENTS

Additionally, the lumbar spine must be regarded from the perspective of the different segments being reflectorically connected to the endocrine glands and the reproduction organs:

- The pituitary gland is associated with the first cervical to the second thoracic vertebrae.
- The thyroid is associated with the cervico-dorsal area.
- The lower thoracic and lumbar region (T12 -L2) influences the uterus, ovaries and tubes via the sympathetic chain.
- The sacral segments (S2-S4) are in close parasympathetic connection to the uterus via the pelvic nerve (see chapter 2.2.3., figure 9 !).

Vertebral restrictions on different levels can disturb the autonomic nervous system and also cause referred pain. Pottenger found, for example, that uterine pain may be localized anywhere between T 10 and L5 or in the sacral zone.¹

The sacrum should also be examined for intraosseous lesions!

The complex nerval connections of the female reproduction tract are described in the chapter on anatomy.

Osteopathic treatment to relieve somatic dysfunction should focus on spinal segmental levels of T10-L2, the sympathetic nerve supply that influence adrenal and ovarian function, as well as uterine contractility.²

The afferent as well as the efferent nerval connections emphasize the importance of the thoraco-lumbar junction and the sacral area for the osteopathic treatment!

5.5. INFLUENCE ON THE CRANIO-SACRAL SYSTEM

The effect of many cranio-sacral techniques is a regaining of the autonome flexibility, which means an improved ability of the autonomic nerval system to react on stress and challenges. As the autonomal nerval system plays an important role in the homeostatic activity, many homeostatic mechanisms gain back their efficiency when the flexibility is reinstated.³

Work on the cranio-sacral area is presumably the most direct influence on hormonal activity: Intracranial membranous stresses can restrict the circulation and so disturb the portal vascular system with the neurohumoural junction between the pituitary and hypothalamus.⁴

For example a fixed spheno-basilar symphysis (SBS) in flexion may give traction on the tentorium cerebelli through the diaphragma sellae to produce pituitary circulatory changes.

¹ Turner 1980

² Ward 2003

³ Upledger 1991

⁴ Turner 1980

Even a lumbo-sacral torsion can affect intracranial membranes by downward traction on the tentorium and falx via the spinal dura and vice versa.

It has also been found that the tension of the dura mater with its inelastic connection between the occiput and sacrum (S2) is of great importance.

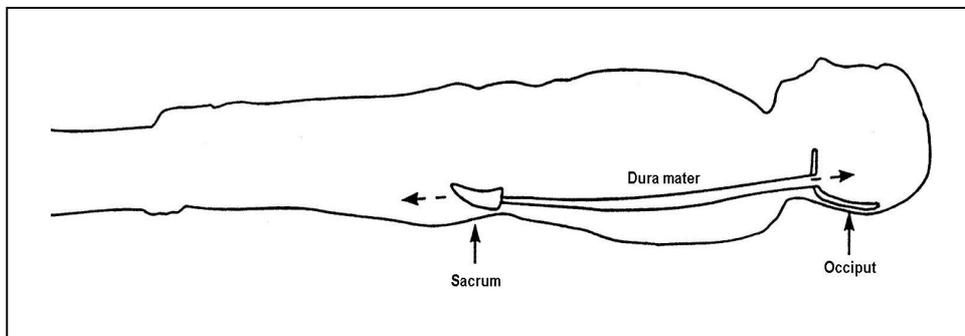


Fig. 12: Continuity of the Dura Mater

The harmony of the motion between occiput and sacrum influences the possibilities of optimal adaptability to pregnancy essentially. A so called „whiplash“, in osteopathic terms a dysaccordance of the cranial motion of occiput and sacrum, is repeatedly found in pregnant women and should definitely be balanced.

5.6. IMPROVEMENT OF BODY PERCEPTION

I could easily imagine that the founder of osteopathy, Adrew T. Still, who was a methodist and the son of a priest, would have liked the teleologic explanation of pain during pregnancy as a way of making a woman more careful.

One osteopathic side effect is of course the fact that patients get more sensitive and familiar to their own bodies. To manage the enormous changes in their bodies as well as possible and to be prepared for the process of delivery, pregnant women profit from learning to be sensitive and familiar with themselves. This may have the consequence that pain is no longer necessary for this aim.

Patients are often surprised of what they can feel and learn about themselves when they get an osteopathic treatment. Other studies about osteopathic treatment for pregnant women also found a positive physical, mental and psychological preparation effect with a closer tie between mother and child.¹

Since osteopathy is not only a science but also a philosophy this point should not be neglected in the considerations of how pregnant women can benefit from osteopathic treatment.

This chapter does not pretend to be complete! The osteopathic treatment possibilities are too complex, diverse and individual to be listed and described here. I do hope, though, that some thoughts and cohesions have been made clear even to non-osteopaths.

¹ Georgiades 2000

6. METHODOLOGY

6.1. STUDY POPULATION

This trial is based on a non-randomised, convenience sampling with women in my area. They all volunteered to take part in the study and met the in- and exclusion criteria. It was not possible to do a randomized sampling for this study.

Intervention Group:

The probationers were sent by their gynecologists or mid-wives or had heard about the opportunity from others (snowball-effect).

15 women came to the first meeting where they filled in the questionnaires. With these as a basis, I decided whether they were suitable for my project. Of the 15 women who consulted me 12 met the criteria. Of the remaining three, two scored too low in the questionnaires and therefore did not meet the inclusion criteria. One woman had to be excluded due to repeated bleedings.

There were no drop-outs during the test period.

Control Group:

In order to create a control group I went to birth-preparation courses, as these are the likeliest places to meet pregnant women. There I asked if anyone suffered from low back pain, pelvic pain or sciatica and if they would volunteer to complete my questionnaires. At most visits some volunteered and if they met the inclusion criteria I gave them another copy of the tests plus a general questionnaire (see appendix) in a prepayed envelope. I asked them to fill in the questionnaires a second time in about a month and send them back to me. Not all sent them back so 19 women were needed to get the 12 adequate answers for the control group.

6.2. INCLUSION- AND EXCLUSION CRITERIA

Inclusion Criteria:

- primi- and multipregnant women

I did not see any reason to make a differentiation between women being pregnant with the first or a further child for this study.

- 20-35 years old

This is considered the average age for pregnancies without risks.

- 12th - 35th week of gestation

These are usually the weeks of stable pregnancy with low risks of a spontaneous abortion or early delivery.

- impairment of back pain

The probationers should have at least 5 points on the Roland-Morris Scale.

- maybe a history of back pain before the pregnancy

The study intends to include women with various reasons for their back- and pelvic problems and to see, if they show different courses.

- agreement of the probationer

The participation in the study is voluntary and all probationers were well informed.

Exclusion Criteria:

- 1st - 12th week of gestation
Most spontaneous abortions occur in the second or third month of pregnancy. There exists no hints that osteopathic treatment could cause miscarriages but I did not want to take any risks of getting in connection with a possible miscarriage.
- 36th week of gestation and more
The observation time of a probationer should be at least 4 weeks. This might not have been achieved in case of early labour.
- any risk factors for the pregnancy
like diabetes, eclampsia or vaginal bleedings
- neurological affections
like multiple scleroses, epilepsy or severe rheumatological diseases
- abnormal development of the pregnancy
like placenta praevia, placental abruption, preterm labour, prolapsed umbilical cord
- multiple pregnancy

6.3. INTERVENTIONS

The probationers (group A) received 3 osteopathic treatments during a period of about 4 weeks. The treatments were not standardized ("black box"). However, all probationers were examined in the same way so it is possible to follow the pathways of their treatments. The treatments followed the osteopathic considerations described above.

The patients were treated in a sitting, standing, supine or side position, whatever they tolerated the best. Both direct and indirect treatment modalities were applied. Of course, general contraindications e.g. for high velocity low amplitude techniques were given special attention as well as the patient's acceptance.

The probationers did not receive other interventions like physiotherapy, acupuncture or drugs during the trial period.

All interventions were done by the same osteopath (myself).

Group A filled in the questionnaires and the pain rating scale three times: at the starting point, after 2-3 weeks and at the end of the observation time after 4-6 weeks.

The results of the measurements in between were taken to demonstrate the development more clearly since the number of probationers was so small.

The control group (group B) received any treatment of their choice during this period. They did not know what the study was about. It was ment to show the standard treatment for this problem. It appeared, however, that few of them had any treatment at all.

Group B filled in the questionnaires twice, at the beginning and the end.

There has been no placebo-control group in this study.

6.4. MEASUREMENT OF EFFECT

The definition of back pain is typically restricted to a highly variable self-reported symptom - the sensation of pain in the back. Low back pain studies usually focus on health-related quality-of-life outcome parameters.¹

Both groups were tested before and after the intervention time with the same tests.

These tests were a visual pain-rating scale (VAS) and a functional disability questionnaire (Roland-Morris), see appendix.

The Roland-Morris Disability Questionnaire(RDQ):

Condition-specific health status measures are commonly used as outcome measures in clinical trials. The RDQ is a health status measure designed to be completed by patients to assess physical disability due to low back pain. It was derived from the Sickness Impact Profile (SIP), which is an extensively tested but long (136 items) health status measure.²

24 items were selected from the SIP by the authors because they related specifically to physical functions that were likely to be affected by low back pain. It describes disability as a combination of physical disability and social restriction.

The RDQ is one of the most widely accepted back-specific scales, used in a wide variety of situations over many years in many countries. It has been compared to other established measures and tested for its scientific validity, internal consistency, reproducibility and responsiveness.³ There also exists a validated German translation, which was important for the performance of the study in Austria.⁴

Probationers that complete the RDQ are asked to place a check mark beside a statement if it applies to them. The score is calculated by adding up number of items checked. Items are not weighted. The scores therefore range from 0 (no disability) to 24 (maximum disability).

Each item in the test is qualified with the phrase "because of my back" to distinguish back pain disability from disability due to other causes. This seemed to be very important for my study since it was likely that all the women had some restrictions of physical functions and it was my intention to rate only those which were caused by their back- or pelvic problems.

The RDQ does not attempt to measure psychological distress associated with back pain.

Several investigators have argued for measuring pain and function separately.⁵ So a combinations of generic and specific measures is generally recommended. The authors of the RDQ also recommend the combination with a pain scale.

¹ Bouter LM et al. 1998

² Lurie 2000

³ Kopec J. 2000

⁴ Exner V. 2000

⁵ Kopec J. 2000

Visual Analog Scale (VAS):

Measure for pain was the subjective pain intensity on a 100 millimeters visual analog scale (see appendix) with the end points 0 = no pain and 100 = unbearable pain. Probationers mark their sensation on the horizontal line.

I preferred the VAS to a numeric scale from 1 to 10 to keep it more objective. Since there were no blindings, probationers may want to please the study. With the VAS it is harder to remember the first mark and it would be more likely for the probationers to mark their true sensation of the pain.

6.5. EVALUATION METHOD

For the analysis of the questionnaires the Wilcoxon test was applied to show differences within the treated group (group A) at different times.

Concurrent differences between the treated group (group A) and the control group (group B) were tested with the Man-Whitney U test.

The Spearsman Rank correlation coefficient was used to show the correlation of the R.-M. Questionnaire and the Pain-Scale.

7. ANALYSIS OF OUTCOME MEASURES

7.1. RELEVANT BASELINE CHARACTERISTICS

The two groups showed a homogeneous picture concerning suspected risk factors for back and pelvic pain. The probationers were asked to state the following: age, civil status, type of work, previous back problems, physical exercise, drugs, number of earlier pregnancies and week of gestation.

Age:

<i>age</i>	<i>group A</i>	<i>group B</i>	<i>totals</i>
mean	30,08	30,42	30,25
sd	3,23	3,03	3,07

Civil status:

<i>civil status</i>	<i>group A</i> <i>n (%)</i>	<i>group B</i> <i>n (%)</i>	<i>totals</i> <i>n (%)</i>
married or in partnership	12 (100%)	12 (100%)	24 (100%)
single	-	-	-
totals	12 (100%)	12 (100%)	24 (100%)

Occupation:

<i>Occupation</i>	<i>group A</i> <i>n (%)</i>	<i>group B</i> <i>n (%)</i>	<i>totals</i> <i>n (%)</i>
fulltime	4 (33,3%)	4 (33,3%)	8 (33,3%)
parttime	7 (58,3%)	4 (33,3%)	11 (45,8%)
household	1 (8,3%)	4 (33,3%)	5 (20,8%)
totals	12 (100%)	12 (100%)	24 (100%)

Previous back problems:

<i>previous back pain</i>	<i>group A</i> <i>n (%)</i>	<i>group B</i> <i>n (%)</i>	<i>totals</i> <i>n (%)</i>
yes	4 (33,3%)	3 (25,0%)	7 (29,2%)
no	8 (66,7%)	9 (75,0%)	17 (70,8%)
totals	12 (100%)	12 (100%)	24 (100%)

Sport:

<i>Sport</i>	<i>group A</i> <i>n (%)</i>	<i>group B</i> <i>n (%)</i>	<i>totals</i> <i>n (%)</i>
yes	8 (66,7%)	8 (66,7%)	16 (66,7%)
no	4 (33,3%)	4 (33,3%)	8 (33,3%)
totals	12 (100%)	12 (100%)	24 (100%)

Drugs:

<i>prescriptions</i>	<i>group A</i> <i>n (%)</i>	<i>group B</i> <i>n (%)</i>	<i>totals</i> <i>n (%)</i>
yes	0 (0,00%)	0 (0,00%)	0 (100%)
no	12 (100%)	12 (100%)	24 (100%)
totals	12 (100%)	12 (100%)	24 (100%)

Number of previous pregnancies:

<i>pregnancies</i>	<i>group A</i> <i>n (%)</i>	<i>group B</i> <i>n (%)</i>	<i>totals</i> <i>n (%)</i>
0	4 (33,3%)	7 (58,3%)	11 (45,8%)
1	7 (58,3%)	5 (41,7%)	12 (50,0%)
2	1 (8,3%)	-	1 (4,2%)
totals	12 (100%)	12 (100%)	25 (100%)

Week of Gestation:

<i>week</i>	<i>group A</i>	<i>group B</i>	<i>totals</i>
mean	25,92	29,42	27,67
sd	4,74	3,70	4,22

7.2. PHYSICAL DISABILITY

Measure for function was the Roland-Morris Disability Questionnaire, as described in 6.4.. Both groups filled in the test at the beginning (T₁), group A additionally after 3-2 weeks (T₂) and both groups again after about 6 weeks (T₃).

Mean scores and standard deviations of the R. -M. Questionnaire from the intervention group (group A) and the control group (group B) at time T₁, T₂ and T₃:

<i>R.-M.Questionnaire</i>	<i>Group A</i>		<i>Group B</i>	
	<i>mean</i>	<i>sd</i>	<i>mean</i>	<i>sd</i>
T ₁	9,00	3,84	6,92	2,15
T ₂	4,00	3,77	-	-
T ₃	2,50	3,63	6,94	5,18

There was no significant difference between the two groups at the beginning of the period, though the value for group A was slightly higher. Group A had a mean value of 9,00 points and group B of 6,92 points (of 24 possibles).

While there was no change in the control group (value points 6,94) the intervention group improved greatly (value points 2,5!).

The concurrent differences between the intervention group and the control group at time T₁ and T₃ were tested with the *Mann-Whitney U Test*. It was not significant at the beginning but showed a significant difference ($p < 0,01$) at the end of the observation time.

Within the intervention group the scores also improved significantly from the first measurement T₁ to the second T₂ and further from the second to the last evaluation T₃ ($p < 0,01$).

The *Wilcoxon Test* was applied here for group A to compare the scores of T₁-T₂, T₂- T₃ and T₁- T₃ .

This shows that even one or two osteopathic treatments brought significant improvement, although further treatment gave even better results.

7.3. PAIN INTENSITY

The average pain intensity of one week was measured with the visual analog scale 0-100mm (see 6.4.). Again the intervention group marked the scale three times and the control group twice.

Mean scores and standard deviations of the visual analog scale at time T₁, T₂ and T₃ :

<i>VAS</i>	<i>Group A</i>		<i>Group B</i>	
	<i>mean</i>	<i>sd</i>	<i>mean</i>	<i>sd</i>
T ₁	5,42	1,98	4,34	1,61
T ₂	2,60	2,35	-	-
T ₃	1,29	1,88	5,12	2,23

Again, at the beginning there was no significant difference although group A started with higher points (group A 5,42mm, group B 4,34mm).

Whereas the intervention group improved significantly ($p < 0,01$) to a value of 1,29mm the value of the control group increased to 5,12.

As for the disability scores the Mann-Whitney U Test got applied for the differences between group A and group B.

The difference in pain reduction between the two groups was statistically high significant ($p \leq 0,001$).

For the calculations of pain reduction within group A between T₁-T₂, T₂- T₃ and T₁- T₃ the Wilcoxon-Test got used again. All of the three results showed a significant improvement ($p < 0,05$).

These tests show again that even one or two osteopathic treatments brought significant improvement, although further treatment gave better results.

7.4. CORRELATION BETWEEN THE DISABILITY QUESTIONNAIRE AND THE VAS

Both the R.-M. Disability Questionnaire and the VAS have been tested for their validity, internal consistency, reproducibility, responsiveness etc.¹

The Roland -Morris Disability Questionnaire is a widely accepted scale designed to assess physical disability due to low back pain. It is recommended for a wide variety of situations. The correlation between the R.-M. Questionnaire and the VAS is also said to be relatively high.

Since I have found no hint of whether the R.-M. Questionnaire was also suitable for the specific group of pregnant women with back pain, I wanted to check the correlation between the R.-M. Questionnaire and the VAS within this study.

We applied the *Spearman Rank Correlation Coefficient* to check the correlation between the two tests in the present group of patients:

<i>R.-M. Questionnaire. - VAS</i>	<i>Spearman Correlation Coefficient</i>	<i>Significance p</i>
T ₁	0,491	< 0,01
T ₃	0,823	< 0,001

It appeared that the R.-M. Questionnaire significantly correlated with the visual pain scale ($p < 0,01$). So one can assume that the R.-M. Questionnaire is a suitable measure for pregnant women with back pain.

¹ Roland 2000

8. RESULTS OF THE OSTEOPATHIC EXAMINATIONS AND TREATMENTS

Most studies on this issue are retrospective and there seems to be a lack of information about the clinical status of pregnant women with back pain.¹ I therefore decided to share my results of the examinations of the 12 women in the experimental group that could be of interest.

8.1. STRUCTURAL PELVIC REGION

Many articles about back and pelvic pain in pregnancy speculate that the main problem lies in a dysfunction of the sacroiliac joints.² That is the reason for my decision to document this region in greater detail.

For the examination of the lumbosacral area and the sacroiliac joint on pregnant women the test of the rhomboid fossa is the most suitable. The sacroiliac joint, the spinal process of the 5th lumbar and the apex of the sacrum are palpated with 4 fingers. Going into squatting position the distance between them ought to remain proportional. This way, not only nutation and counternutation of the sacrum but also eversion and inversion of the ilium are tested.³

Additionally the Standing and Sitting Flexion Test is accomplished, e.g. as described in Greenman p. 312 and p. 316.⁴ This test also examines proper function of the sacrum and the ilia.

At the first examination, the test of the rhomboid fossa showed that 8 women (66%) had unproportional distances in squatting position, 6 women (50%) had a positive Standing Flexion Test and 4 (33%) a positive Sitting Flexion Test.

10 out of 12 women (83%) had one or more positive tests.

<i>Test</i>	<i>Number of Positive Results</i>	<i>%</i>
Rhomboid Fossa Test	8	66
St. Flexion Test	4	50
Si. Flexion Test	6	33
One of All Tests	10	83

The importance of the mechanical side of the pelvic region is evident but in my point of view it is too early to draw the conclusion that a manipulative technique for the sacroiliac joint solves the problem. It rather demands a more detailed view of the matter.

¹ Kristiansson 1996

² Daly 1991

³ Peeters L. 1993

⁴ Greenman Ph. 1996

The following tabulation shows the importance of some connected structures:

<i>Test</i>	<i>Number of Positive Results</i>	<i>%</i>
Pubic Symphysis	4	33
Psoas Muscle	6	50
Piriform Muscle	5	42
Membrana Obturatoria	10	83
Coccyx	3	25
Lumbar Spine Blockade	7	58
Sacrotuberal or -spinal Ligg.	8	66

The pelvic floor was examined with the Membrana Obturatoria, which was chosen to test the shock absorbing quality of the perineum as well.

During the first treatment I did not use any direct or indirect techniques to correct sacroiliac or iliosacral lesions and mainly worked with ligaments and soft tissue structures in this region. However, I did treat symphyseal problem immediately with muscle-energy techniques. Half of the sacroiliac problems did not need any adjustment the following time, whereas 70% of the lumbar lesions needed adjustment. I used muscle-energy or impulse techniques for the sacroiliac problems and lumbar role with impulse mobilization for the lumbar spine. Treatment techniques are described in any standard osteopathic texts, such as "Principles of Manual Medicine"¹. S. Sandler, director of *The Expectant Mothers Clinic* in London describes some adaptations of standard techniques for pregnant women.²

Since I find it important to connect osteopathy and orthodox medicine it was essential to include the differentiation tests between "normal" back pain and PPPP, which I had found in several articles, as described in chapter 3.2. Of the 12 examined women 5 had a positive Straight Leg Raise Test and 8 a positive provocation test for PPPP. Only 2 women showed no positive sign at all.

<i>Test</i>	<i>Number of Positive Results</i>	<i>%</i>
SLR-Test	5	42
Provocation Test	8	67
One of Both Tests	10	83

There were 10 women of the category "PPPP" and 2 with "normal" back pain. Still, from an osteopathic point of view no distinctions between the two groups were found (of course knowing that it was a very little group to observe).

¹Greenman 1996

²Sandler 1996

8.2. THORACIC DIAPHRAGM

Another very important result of the examinations of the 12 probationers was that **all of them had an asymmetric diaphragmatic tension.**

Diaphragmatic tension may be produced by specific joint somatic dysfunction and also by fascial pull or torsion at the thoracolumbal junction.

This is one of a variety of ways to diagnose and treat asymmetrical motion of the diaphragm and in my opinion especially expedient when working with pregnant women.

Examination:

The therapist stands beside the supine patient and holds the lateral sides of the lower chest cage with the palms of his hands. Then he rotates the lower thoracic "cylinder" (thoracolumbar junction) towards the right and then the left and senses any asymmetry in fascial and gross motion. He also translates the cylinder right and left to determine any side-bending in this area. The thoracolumbar fascia usually prefers to rotate in one direction and side-bend in the other.

While the patient is asked to inhale and exhale deeply, asymmetric contractions of the diaphragm can be detected.¹

Treatment:

To establish symmetrical excursion of the thoracoabdominal diaphragm the same position as for testing is used. First the lower rib cage is rotated to one side and translated to the other until a moderately firm resistance is sensed and is held in this position. The patient is asked to take three or four deep breaths. Then the therapist holds the rotation but changes the direction of the translation to the same side (direct technique). The patient is again asked to breath deeply while the therapist continues to hold. This allows the diaphragm to redome itself and become more effective in the processes of respiration and as an extrinsic pump for the lymphatic system.¹

8.3. CRANIOSACRAL SYSTEM

Finally, the third block of interesting results were found in the craniosacral system. 5 women (42%) had an asymmetric movement of the synchondrosis sphenobasilaris and 6 women (50%) an inharmonious movement between the occiput and the sacrum.

<i>Test</i>	<i>Number of Positive Results</i>	<i>%</i>
SSB	5	42
Occiput-Sacrum	6	50

Reasons and consequences of a craniosacral movement are manifold. I think that this system influences and interferes with many adaptation mechanisms which are necessary during pregnancy while they stay inconspicuous under regular circumstances.

So regulation seems to be an important part of treatment.

¹ Ward 2003

9. DISCUSSION

9.1. CONCLUSION

Low back pain is a common condition during pregnancy. The treatment of low back pain in pregnant patients is essentially different from the treatment of non-pregnant patients. Few studies have focused on a solution for back and pelvic problems in pregnancy. Suggestions of specific treatment or prophylaxis are scarce in literature.¹ This study intends to introduce osteopathy as an effective therapy for pregnant women suffering from back pain.

Although the sample of this study is too small for a scientifically relevant result it is still evident that **osteopathy is a good method to treat complaints around the back and pelvic region of pregnant women.**

While discomfort and disability of the probationers of the control group did not change at all, the osteopathically treated women improved immensely in both aspects. **Pain and disability could be significantly reduced**, as demonstrated and measured with a visual pain scale and a disability questionnaire.

Many women profited already after one treatment, although two or three seemed to bring even more relief. This makes treatment relatively cheap for the women and does not consume much of their time.

Many people with "regular back pain" hope for the self-limiting effect of their complaints. This study shows that it does not occur during pregnancy!
The average pain and discomfort of the control group remained the same throughout the observation time. As there are several studies about complications during labour and chronification of pelvic pain after delivery for those women with back problems during pregnancy, the problem should not be ignored. Therefore the aim of treatment should be to relieve symptoms in the short term in order to prevent long term dysfunction.²

From which anatomic structure pain emerges is broadly unknown as well as manifold. This meets the osteopathic elements of complexity and interdependence of many structures in the human body. It also seems to be the big advantage of the osteopathic philosophy and method and explains part of the good results of the treatments in this study. An osteopath can see the woman in her entirety and must not focus on one structure.

Clinical observations show increased joint mobility very early in pregnancy, long before there is a physiological need for it. This is due to the hormonal changes - oestrogens, progesterone and, probably most important, relaxin rise dramatically. So when treating a pregnant woman the changes in the tissues due to raised hormonal levels should be considered! It is inferable that manual techniques are better than mechanical ones for response.

Many different techniques were used for the osteopathic treatment such as structural, visceral (no internal techniques) and craniosacral ones, depending on examination results and the women's acceptance. The pregnant women were of course not treated in a prone position.

¹ Ostgaard 1994

² Sandler 1996

The best treatment positions were side lying or sitting in order to avoid too much pressure on the vena cava by the gravid uterus.

Both general and specific contraindications were observed conscientiously and everything indicated that these therapies were **comfortable and safe** for the women.

Although none of the probationers had received an osteopathic treatment before the **acceptance was excellent**. Many of them had hardly ever heard of osteopathy before and some had only come because they had been told about the study and the possibility of treatment by other pregnant women. All of them felt secure and comfortable during and after treatments.

This can also be confirmed by the fact that there were **no drop-outs** within the intervention group.

It was also clear that the osteopathic treatment had several **additional positive effects**. Women declared that they experienced less problems with the following discomforts:

- edemas
- headaches
- sleeping problems
- malady
- incontinence
- psychological trouble or stress

Most of these effects can probably be explained by the positive influence of osteopathic treatment on the implications of congestion during pregnancy.

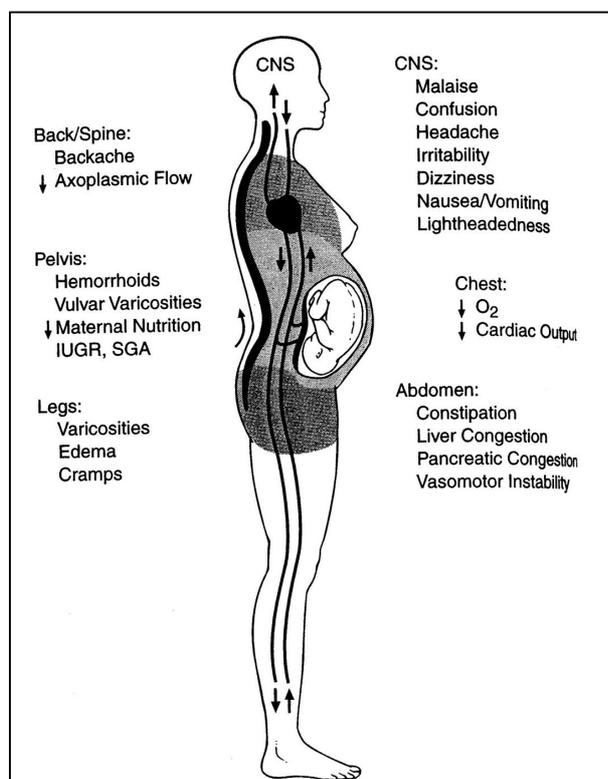


Fig. 13: Pathophysiologic Effects of Congestion during Pregnancy

The probands often felt that the foetae became less heavy and easier to carry. They also felt more familiar to their own bodies which sometimes had become strange to them with all the changes during pregnancy. This made them more self-confident and helped them straighten up.

Only 25% of the control group received any treatment at all. Two were treated by a physiotherapist and one had massages and heat applications.

That emphasizes the importance to inform medical doctors and other people concerned that there are possibilities for help!

Especially in pregnancy many women do not want to take any medication against their discomforts as that might involve risks for their unborn children. This also makes it important to inform about other possibilities of treatment such as osteopathy, although its efficiency still needs to be proven.

9.2. COMMENTS ON THE STUDY DESIGN

This study is the completion of a 6-years-lasting osteopathic training but it also intends to be a component for the demand of "evidence based medicine" in osteopathy. So it is important not only to look at the results of the study but also analyze methodology and study design. In this small one-person study several points could not get performed optimally which I want to describe below.

9.2.1. Study Population

In order to prove the efficacy of intervention for low back pain the randomized clinical trial (RCT) is considered to be gold standard.¹

Due to the small size of this study, it has not been possible to meet all criteria of an RCT.

A trial with only 24 probationers cannot be said to be scientifically significant. It can, however, be **seen as a pilot project** for more comprehensive studies to follow. It was not possible to examine more probationers for this thesis but a positive tendency of the results can still be derived.

Both the intervention group and the control group were selected according to availability and there was no randomization procedure. So caution must be taken when generalizing results of the trial to the general population.

In the intervention group there were no drop-outs at all, showing good cooperation with the patients as well as good acceptance of the method.

The great number of drop-outs of the control group (7 out of 19) is readily explainable. The women did not know much about me or the study and I depended fully on their benevolence to fill in the questionnaires after one month and send them back to me without benefits. Some of them might have forgotten it and some might have been suspicious about its background.

¹ Koes 1995

I judged it easier to start with a big group and expect drop-outs than to make an effort not to lose any volunteers within a smaller group.

9.2.2. Intervention

There has been neither blinding nor placebo treatment in this study.

A blinding of the probationers is only possible in a study with a placebo treatment. Ethical reasons prevented me from completing such a study. I was not prepared to examine suffering women without giving them any possibility of treatment, knowing they would soon be delivering. Therefore, I decided to compare the intervention group to "standard-treatment".

Nevertheless, blinding can (partly) be established by including naive patients (no previous experience with the treatment under study).¹ Even though it had not been an inclusion criterion, none of the probationers had ever had osteopathic treatments before and most of them hardly knew anything about it. I draw the conclusion that they had relatively neutral expectations, neither positive nor negative experiences with osteopathy and that it therefore could be seen as an adapted blinding.

However, the women in the intervention group were in closer contact with the study and myself and might have expressed their sympathy by pleasing the study with good results, whereas the control group hardly knew anything and may have stayed more neutral when answering the questionnaires.

Had the emphasis of this study been put more on the outcome of the osteopathic examinations, it would have been favourable to have examinations and treatments made by two independent and neutral examiners.

A blinded examiner, however, would have had to examine both groups, with the ethical dilemma I described above.

The opinions, whether the interventions under study should be standardized, are controversial but it is not the task of this study to discuss this issue of osteopathic trials. I, for my part, decided to use the "black box"-model for the interventions because of the complexity of osteopathic tools and to have the possibility of choosing the best individual treatment for each probationer. An osteopathic treatment is not a prearranged set of movements and thrusts given to each patient, but an ongoing stimulus/ response synergism between the physician and the patient.¹

Still, a study with standardized osteopathic treatment would also be of great interest.

¹ Ward 2003

9.2.3. Measurement of Effect

The outcome measures, the Roland-Morris disability questionnaire and the visual analogue pain scale, seemed to be reliable for the low back pain problem in this study. They have been used in several back pain trials before and have been proved to be valid, precise and sensitive for measuring clinically relevant changes. I did not find any application for pregnant women, however.

The two different tests usually correlate very well, as they also do in this study, so I conclude that the measures were adequate for the probationers of this study.

Furthermore, the questionnaires are quick and easy to fill in with little or no risk of misunderstandings. All probationers in this study filled in the sheets correctly.

9.3. OUTLOOK

It would also have been instructive to observe the influence of additional factors such as physical fitness, previous pregnancies or previous back problems in relation to the results. This, of course, was not possible with such a small number of probationers and this information was only used to confirm the homogeneity of the intervention- and control groups in this study.

Further differentiation of the control group relating to the method of treatment could also have been pursued. E.g. a study that compares osteopathic treatment and physiotherapy, or chiropractic treatment of the same problem. However, the aim of this study was to compare osteopathy with the *standard treatment* of back pain complaints.

Some authors proclaim that there is a statistically significant association between back pain during pregnancy and during labour.¹ In accordance with that, it would have been interesting to follow the treated women as well as the control group until giving birth and study their pain during labour.

Further studies describe the fact that a back- or posterior pelvic pain of high intensity indicate little regression of pain after delivery.² A study of this correlation would certainly be beneficial for women in particular and for public health services in general.

A better medical condition of pregnant women is also a matter of costs. It would therefore have been very informative to compare the lengths of the sick leaves but this would also have gone beyond the limits of this study. In Austria women go on maternity leave in the 32nd week of gestation and cannot be employed after that time. Therefore, I should have limited this study to women with back pain before the 32nd week. Additionally, it is questionable to include women who are already stay-at-home mothers.

All these ideas were beyond the scope of this study. However, they want to give hints for further exploration of the issue which is very interesting, promising and important!

I hope this study motivates others to continue further research in this field !!

¹ Diakow 1991

² Ostgaard 1996

10. ABSTRACT

Osteopathy for Back and Pelvic Pain in Pregnancy

Undergraduate Project for the Diploma of the Wiener Schule für Osteopathie (WSO),
May 2003

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Study Design: A prospective clinical case study of pregnant women with back or pelvic pain, 12 probationers in the intervention group and 12 in the control group.

Objective: Few studies focus on a solution to the pelvic pain problem of pregnant women. The intention of this study was to evaluate the efficiency of osteopathic treatment and compare it with results of standard treatment.

Summary of Background Data: About 50% of pregnant women suffer from back or pelvic pain. The pathogenesis of pelvic and low back pain during pregnancy is broadly unknown and manifold. It is hypothesized that peripartum pelvic pain is caused by strain of ligaments in the pelvis and lower spine resulting from a combination of damage to ligaments, hormonal effects, muscle weakness and the weight of the foetus; Up to now compensated postural problems have a tendency to get aggravated. It occurred not only to be a handicap for the women but also a risk factor for birth complications and the development of chronic back problems.

Methods: 24 pregnant women at the 18th-34th week of gestation with pelvic pain and similar starting situations were followed for 8 weeks. They filled in questionnaires at the beginning and the end of the observation period. Measure for pain intensity was a 10 cm Visual Analogue Scale, measure for physical disability the 24 points counting Roland Morris Disability Questionnaire. The intervention group received 3 osteopathic treatments ("black box"-model), the control group any treatment they preferred.

Results: The two groups showed a homogeneous starting point in base line characteristics, pain and disability scores. After 8 weeks the intervention group improved significantly ($p < 0,01$) in both aspects, pain and disability. The control group registered no change in pain nor in disability. Furthermore, it occurred that only 25% of them had any treatment at all.

Conclusion: Osteopathy seemed to be a safe, pleasant and effective treatment for pregnant women with back or pelvic pain. The study also showed that the problems did not decrease with time without any intervention, so it should no longer be ignored or seen as something unalterable.

Keywords: osteopathy, pregnancy, back pain, peripartum pelvic pain

11. LIST OF ILLUSTRATIONS

Figure 1, p. 8: Malcolm Symonds E., Symonds Ian M.: Essential Obstetrics and Gynaecology. Churchill Livingstone 1998 (p. 22)

Figure 2, p. 9: Malcolm Symonds E., Symonds Ian M.: Essential Obstetrics and Gynaecology. Churchill Livingstone 1998 (p. 23)

Figure 3, p.9: Peeters L., Lason G.: Das Becken. OSTEO 2000 b.v.b.a.1993 (p. 93)

Figure 4, p. 11: Klein P., (Arrangement and Illustration Sommerfeld P.): Biomechanik der Beckenregion, Paper of the WSO 1995 (p.3)

Figure 5, p. 11: Ward R.: Foundations for Osteopathic Medicine(Second Edition). AOA. Williams&Wilkins 2003 (p. 1252)

Figure 6, p.12: Peeters L., Lason G.: Das Becken. OSTEO 2000 b.v.b.a.1993 (p. 63)

Figure 7, p. 13: Heller A.: Geburtsvorbereitung Methode Menne-Heller. Thieme Verlag, 1998 (p. 26)

Figure 8, p. 14: Ward R.: Foundations for Osteopathic Medicine(Second Edition). AOA. Williams&Wilkins 2003 (p. 410)

Figure 9, p. 15: Ward R.: Foundations for Osteopathic Medicine(Second Edition). AOA. Williams&Wilkins 2003 (p. 454)

Figure 10, p.18: Ostgaard H. C., Zetherström G., Roos-Hansson E., Svanberg B.: Reduction of Back and Posterior Pelvic Pain in Pregnancy. Spine 1994, Vol 19 (8) (p.896)

Figure 11, p. 18: Ostgaard H. C., Zetherström G., Roos-Hansson E., Svanberg B.: Reduction of Back and Posterior Pelvic Pain in Pregnancy. Spine 1994, Vol 19 (8) (p.896)

Figure 12, p. 34: J. E. Upledger, J. D. Vredevoigt: Lehrbuch der Kranio-Sakral Therapie. Haug Verlag, Heidelberg 1994 (p. 253)

Figure 13, p.48: Ward R.: Foundations for Osteopathic Medicine(Second Edition). AOA. Williams&Wilkins 2003 (p. 453)

12. BIBLIOGRAPHY

Barral J.: Visceral Manipulation II. Eastland Press 1995

Barral J.: Urogenital Manipulation. Eastland Press, Seattle, 1993

Brynshildsen J., Hansson A., Persson a., Hammar M.: Follow-up of patients with low back pain during pregnancy. *Obstet Gynecol* 1998; 91(2): 182-6 [abstract]

Daly JM, Frame PS, Rapoza PA.: Sacroiliac subluxation: a common, treatable cause of low-back pain in pregnancy. *Fam Pract Res J* 1991 Jun; 11 (2): 149-59 [abstract]

Diakow PR., Gadsby JB.: Back pain during pregnancy and labor. *J Manipulative Physiol Ther* 1991

Exner V., Keel P.: Measuring disability of patients with low-back pain - validation of a German version of the Roland & Morris disability questionnaire. *Der Schmerz* 2000, Vol 14 (6), pp. 392-400 [abstract]

Franklin ME, Conner-Kerr T. : An analysis of posture and back pain in the first and third trimester of pregnancy. *J Orthop Sports Phys Ther* 1998 Sep; 28(3): 133-8 [abstract]

Georgiades O.: Osteopathy in the Treatment of Breech Presentation. Diplomarbeit WSO 2000

Greenman P.: Principles of Manual Medicine. Williams &Wilkins 1996

Heller A.: Geburtsvorbereitung Methode Menne-Heller. Thieme Verlag, 1998

Ireland M.L., Ott S.: The Effects of Pregnancy on the Musculoskeletal System. *Clinical Orthopaedics and Related Research* 2000; Nr. 372, pp.169-179

Koes B., Bouter L., van der Heijden G.: Methodological Quality of Randomized Clinical Trials on Treatment Efficacy in Low Back Pain. *Spine* 1995, vol 20 (2), pp. 228-235

Kopec J.: Measuring Functional Outcomes in Persons With Back Pain. *Spine* 2000, Vol 25 (24), pp. 3110-3114

Kristiansson P., Svärdsudd K.: Discriminatory Power of Tests Applied in Back Pain During Pregnancy. *Spine* 1996, Vol 21 (29), pp 2337-2344

Kristiansson P., Svärdsudd K., Schoultz B.: Back Pain During Pregnancy. *Spine* 1996, Vol 21 (6) , pp 702-709

Ligner B.: Personal notes. Vienna 1994-2000

Lurie J.: A Review of Generic Health Status Measures in Patients With Low Back Pain. *Spine* 2000, Vol 25 (24), pp. 3125-3129

- Malcolm Symonds E., Symonds Ian M.:** Essential Obstetrics and Gynaecology. Churchill Livingstone 1998
- Mens J., Vleeming A., Snijders C., Koes B., Stam H.:** Reliability and Validity of the Active Straight Leg Raise Test in Posterior Pelvic Pain Since Pregnancy. Spine 2001, Vol 26 (10), pp 1167-1171
- Mens J., Vleeming A., Stoeckart R., Stam H., Snijders C.:** Understanding Peripartum Pelvic Pain. Spine 1996; Vol 21 (11), pp 1363-1370
- Montague K.:** Osteopathy during Pregnancy. Nursing Mirror 1985, Vol 161/5, pp 26- 28
- Molinari R.:** Personal notes. Maidstone 1997
- Noren L., Östgaard S., Nielsen T., Östgaard H. C.:** Reduction of Sick Leave for Lumbar Back and Posterior Pelvic Pain in Pregnancy. Spine 1997, Vol 22 (18), pp 2157-2160
- Ostgaard H. C., Andersson G.:** Previous Back Pain and Risk of Developing Back Pain in a Future Pregnancy. Spine 1991, Vol 16 (4), pp 432-436
- Ostgaard H. C., Andersson G., Karlsson K.:** Prevalence of Back Pain in Pregnancy. Spine 1991, Vol 15 (5), pp 549-552
- Ostgaard H. C., Andersson G.:** Postpartum low-back pain. Spine 1992, Vol 17 (1): 53-55
- Ostgaard H. C., Andersson G., Schultz A., Miller J.:** Influence of Some Biomechanical Factors on Low-Back pain in Pregnancy. Spine 1993. Vol 18 (1), pp 61-65
- Ostgaard H. C., Zetherström G., Roos-Hansson E., Svanberg B.:** Reduction of Back and Posterior Pelvic Pain in Pregnancy. Spine 1994, Vol 19 (8), pp 894-900
- Ostgaard H. C., Roos-Hansson E., Zetherström G.:** Regression of Back and Posterior Pelvic Pain After Pregnancy. Spine 1996, vol 21 (23), pp 2777-2780
- Ostgaard H. C., Zetherström G., Roos-Hansson E.:** Back Pain in Relation to Pregnancy. Spine 1997, Vol 22 (24), pp 2945-2950
- Peeters L., Lason G.:** Das Becken. OSTEO 2000 b.v.b.a.1993
- Reiter-Horngacher M.:** Osteopathische Geburtsvorbereitung. Diplomarbeit WSO, 2001
- Richardson C., Snijders C. et al.:** The Relation Between the Transversus Abdominis Muscle, Sacroiliac Joint Mechanics, and Low Back Pain. Spine 2002, vol 27 (4), pp. 399-405
- Roland M., Fairbank J.:** The Roland-Morris Disability Questionnaire and the Oswestry Disability Questionnaire. Spine 2000, Vol 25 (24), pp. 3115-3124

- Ruspeckhofer Maria:** Auswirkung von osteopathischen Behandlungen während der Schwangerschaft auf den Geburtsverlauf. Diplomarbeit WSO, 2001
- Russel R., Reynolds F.:** Backpain, Pregnancy, and Childbirth. *BMJ* 1997; 314 (7087): 1062
- Sandler S.:** The osteopathic approach to obstetrics. *Midwife Health Visitor & Community Nurse* 1983, Vol 19, p 365
- Sandler S.:** The management of low back pain in pregnancy. *Director, The Expectant Mothers Clinic, The British School of Osteopathy, London. Manual Therapy* 1996, Vol 1 (4), pp.178-185
- Schmutz JF., Brisard V., Guillaume JP.:** Osteopathische Behandlung der chronischen Lumbalgie. *Münchner Colleg für Osteopathie*, 1996
- Stureson:** Pain pattern in Pregnancy and "Catching" of the Leg in Pregnant Women with PPP. *Spine* 1997, Vol 22, pp. 1880-1883
- Turner S.:** The Application of Osteopathic Principles to Obstetrics, Dissertation 1980
- Upleger J., Vredevogt J.:** Lehrbuch der Kranio-Sakral-Therapie. Haug, 1991
- Vleeming A., Buyruk HM., Stoeckart R., Karamusel S., Snijder CJ.:** Towards an integrated therapy for peripartum pelvic instability. *Am. J Obstet Gynecol* 1992; 166(4): 1243-7
- Vleeming A., Pool-Goodzwaard A. et al.:** The Function of the Long Dorsal Sacroiliac Ligament. *Spine* 1996, Vol 21 (5), pp. 556-562
- Ward R.:** Foundations for Osteopathic Medicine (Second Edition). AOA. Williams & Wilkins 2003

13.APPENDIX

Consent

Case History

Examination

Protocol of Treatment

Recruitment of Probationers

Questionnaire of the Control Group

Roland Morris Questionnaire

Visual Pain Scale

CONSENT

**TO TAKE PART IN THE STUDY "OSTEOPATHY IN
LUMBAR AND PELVIC PAIN DURING PREGNANCY"**

Date:

Name:

Date of birth:

Test Person Number:

I give my consent to take part in this study.

Signature:

**I give my consent to the osteopathic treatment during my pregnancy for this study.
I can deny further participation at any time.**

Signature:

CASE HISTORY**Nr. of test person:** _____**Date:** _____**Name of obstetrician:****Profession:****Sports:****Social status:****Age:****Week of gestation:****Number of previous pregnancies:****Number of previous deliveries:****Traumas, accidents, operations:** 19...
19...
20...**Heavy diseases:** 19...
19...
20...**General condition: (sleep, headache, throat, ears, nose, eyes, teeth)****Digestion:****Allergies:****Prescriptions:****Psyche, stress:****Case history of back pain:****Description of this pregnancy:** ultrasonic screen
pain, labour pains
fetal movement:**Present weight and before pregnancy:****Bloodpressure: left..... right.....**

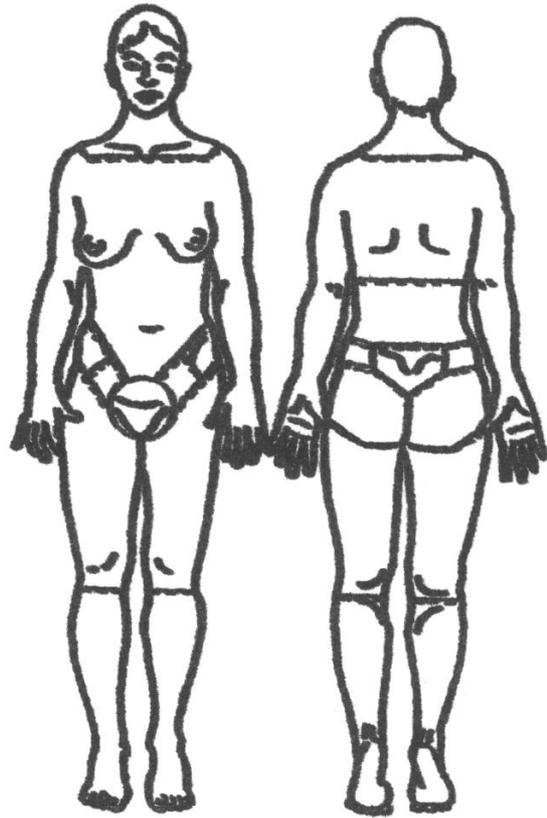
Current pain:

where? (please mark!)

since when? _____

how often? _____

how long? _____



EXAMINATION**Nr. of test person:** _____**Date:** _____

Ecoute while standing position: _____

Observation from posterior: _____

Observation from lateral: _____

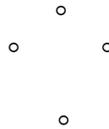
Observation from anterior: _____

Palpation tissue texture paraspinal: _____

Global flexion of head, neck, spine _____

Standing flexion test: _____

Rhomboid fossa test

Motiontest of cervical, thoracal and _____
lumbal region _____

Coccyx-test _____

Sitting flexion test _____

Mobility of hips (supine) _____

Active straight leg raise test (for PPP) _____

Provocationtest for posterior pelvic pain _____

Pubic symphysis _____

Psoas muscle _____

Piriform muscle _____

Membrana obturatoria _____

Classic straight leg raising _____

Uterus _____

other visceral tests _____

thoracic diaphragm _____

Thoracic outlet _____

Craniosacral examination (occiput, sphenoid, tentorium...) _____

Occiput- sacrum _____

Lumbar spine in side position _____

Sacrotuberal ligament _____

Sacrospinal ligament _____

PROTOCOL OF TREATMENT

Nr. of test person: _____

1st Treatment:

Date:

2nd Treatment:

Date:

3rd Treatment:

Date:

4th Treatment:

Date:

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Back- an Pelvic Pain in Pregnancy

I am looking for probationers for the thesis of a 6-year-lasting extra qualification for osteopathy!

The study is about the efficiency of osteopathic treatment for back- and pelvic pain during pregnancy (with or without radiation into the buttocks or legs).

It will be compared with other ways of treatment like massage, acupuncture or bedrest.

Osteopathy is a comprehensive manual method which wants to reach free movement of all structures in the body. This leads to good blood supply and activates the process of self-healing in the body.

Course: 3 Treatments (each about 50-60minutes) every 7-10 days.

Questionnaires to fill in at the beginning and in conclusion.

The probationers can interrupt the treatments at any time!

The treatments are free of charge.

I am also looking for probationers with back pain for the control group who do not want to get treatments but would fill in the questionnaires (takes about 5 minutes)!

Preconditions: 12th - 34th week of gestation
back- or pelvic pain (with or without radiation)
no special risks for the pregnancy

If you are interested, please contact me: # 05356-66536

Gabriele Kofler

Back and Pelvic Pain in Pregnancy

Nr. of test person: _____

Date: _____

Age: _____

Profession: _____

Social status: _____

Week of gestation: _____

Number of previous pregnancies: _____

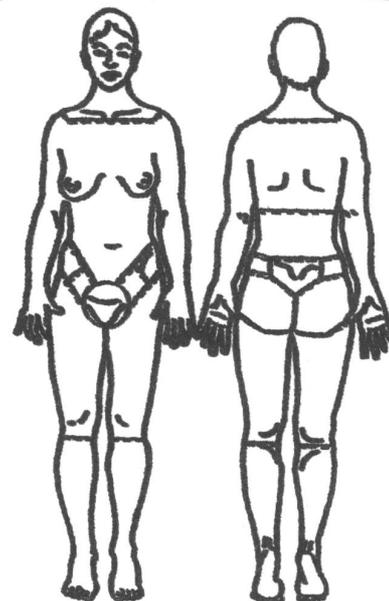
Number of previous deliveries: _____

Do you take any drugs at the moment? If so, which ones? _____

Did you practise sport before your pregnancy? _____

Did you have back pain before your pregnancy? If so, since when and in which way?

Current pain: where? (please mark!)



since when? _____

how often? _____

how long? _____

Did you get any treatment for your current back or pelvic pain? _____

How often did you get treatment?

ROLAND MORRIS QUESTIONNAIRE**Nr. of test person:** _____**Date:** _____

When your back hurts, you may find it difficult to do some of the things you normally do. This list contains some sentences that people have used to describe themselves when they have back pain. When you read them, you may find that some stand out because they describe you today. As you read the list, think of yourself today. When you read a sentence that describes you today, put a circle around its number. If the sentence does not describe you, then leave the space blank and go on to the next one.

Please remember to mark only those sentences that affect you because of your back- or pelvic problem and not because of the pregnancy as such!

Remember only circle the number of the sentences if you are sure that it describes you today.

1. I stay at home most of the time because of my back.
2. I change positions frequently to try to get my back comfortable.
3. I walk more slowly than usual because of my back.
4. Because of my back I am not doing any of the jobs that I usually do around the house.
5. Because of my back I use a handrail to get upstairs.
6. Because of my back I lie down to rest more often.
7. Because of my back I have to hold on to something to get out of an easy chair.
8. Because of my back I try to get other people to do things for me.
9. I get dressed more slowly than usual because of my back.
10. I only stand for short periods of time because of my back.
11. Because of my back I try not to bend or kneel down.
12. I find it difficult to get out of a chair because of my back.
13. My back is painful almost all the time.
14. I find it difficult to turn over in bed because of my back.
15. My appetite is not very good because of my back pain.
16. I have trouble putting on my socks (or stockings) because of the pain in my back.
17. I only walk short distances because of my back pain.
18. I sleep less well because of my back pain.
19. Because of my back pain I get dressed with help from someone else.
20. I sit down for most of the day because of my back.
21. I avoid jobs around the house because of my back pain.
22. Because of my back pain I am more irritable and bad tempered with people than usual.
23. Because of my back I go up and down stairs more slowly than usual.
24. I stay in bed most of the time because of by back.

Score: _____

VISUAL PAIN SCALE**Nr. of test person:** _____**Date:** _____

On an average I would characterize the pain of the last week about here:

