

Pain relief during labour

Essay

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By

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Abstract

Obstetricians and anesthetists exert great efforts to make childbirth a pleasurable and pain-free experience. Nowadays, appropriate intrapartum analgesia are not considered a luxurious option but regarded as beneficial and necessary components of proper obstetric care. There are different methods of pain relief during labour: psychological, physical, pharmacological, local, regional and even general anesthesia. There is no single technique of pain relief applicable to every woman, all methods should be available and the decision is arrived at by the patient, obstetrician and the anesthetist considering both fetal & maternal safety.

Keyword

Labour analgesia

Table of contents

Title	Page
<i>Introduction</i>	<i>1</i>
<i>Anatomy of the female genital tract</i>	<i>4</i>
<i>Physiology of pain</i>	<i>14</i>
<i>Psychological methods of pain relief</i>	<i>23</i>
<i>Physical methods of pain relief</i>	<i>28</i>
<i>Inhalation analgesia</i>	<i>40</i>
<i>Systemic analgesia</i>	<i>49</i>
<i>Local anaesthesia</i>	<i>51</i>
<i>Regional anaesthesia</i>	<i>68</i>
<i>Summary</i>	<i>93</i>
<i>Conclusion</i>	<i>96</i>
<i>References</i>	<i>97</i>
<i>Arabic summary</i>	

List of figures and curves

No.:	Figures	Page
1	<i>Severity of pain rank</i>	2
2	<i>Anatomy of the female genital tract (sagittal view)</i>	6
3	<i>Anatomy of the female perineum</i>	7
4	<i>Referred pain from the female genital tract</i>	13
5	<i>The neospinothalamic tract</i>	17
6	<i>The paleospinothalamic tract</i>	19
7	<i>Labour Pain during Different Stages of Labour</i>	21
8 A&B	<i>Transcutaneous electrical nerve stimulation</i>	29,30
9	<i>Perineal massage</i>	33
10	<i>The Relationship between the contraction and the blood level of Nitrous Oxide</i>	44
11	<i>Different technique of regional anaesthesia</i>	70
12	<i>Anatomy of vertebral column and spinal cord</i>	74
13	<i>Spread of Opioids in the Cerebrospinal Fluid</i>	89
14	<i>Pharmacokinetics of Spinal and Epidural Opioids</i>	90
15	<i>Technique of Epidural Analgesia and Combined Spinal–Epidural Analgesia.</i>	92

List of tables

No.:	Table	Page
1	<i>Pain in labour: pathways and mechanisms</i>	22
2	<i>Classification of opioid receptors</i>	51
3	<i>Recommended dosages of Opioids</i>	60

List of Abbreviations

Abbreviation	Stands for
CNS	Central Nervous System
CSF	Cerebrospinal Fluid
cAMP	Cyclic Adenosine Monophosphate
D5%	Dextrose 5%
IM	Intramuscular
IV	Intravenous
SC	Subcutaneous
mmHg	Millimeters mercury
ml/h	Milliliters per hour
mg/kg	Milligrams per kilogram
MAO	Monoamine oxidase
PaO₂	Arterial Oxygen tension
PCO₂	Partial Pressure of CO₂
PCA	Patient Controlled Analgesia
PCEA	Patient Controlled Epidural Analgesia
p.s.i	Pounds per square inch
prn	Pro re nata (latin for as occasion rises)
q	Quaque(latin for every)
°C	Degrees Celsius
Hz	Hertz
L(1-5) T(1-12) S(1-5)	Lumbar Spinal Segment Thoracic Spinal Segment Sacral Spinal Segment

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MOUTAZ EL-SHERBINI.
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Introduction

Introduction

The only dream of any woman since her birth is to be a mother, however this gorgeous feeling is challenged by the horrible experience called **“labour pain”**, and so pain relief during labour has been a topic of interest since banishment of Adam and Eve from the Garden of Eden.

Studies have shown that when painful life experiences are ranked in order of severity (as shown in figure: 1), labour is rated very highly. Only causalgia (severe burning pain which sometimes follows nerve trauma) and pain following an amputation exceed labour pain in severity.

So we should respect our mothers for being heroes to endure all this pain for us.

Obstetricians and anaesthetists exert great efforts to make child birth pleasurable and pain-free experience. Nowadays, appropriate intrapartum analgesia and anaesthesia are not considered as a luxurious option but regarded as beneficial and necessary components of proper obstetric care (Cunninghame Lindheimer, 1992).

There are different methods for pain relief during labour among them: psychological, physical, pharmacological, local, regional and even general anaesthesia.

However, successful use of each method requires enough knowledge about the dose, technique, advantages, disadvantages, route and timing of administration for the method to be both successful and safe for both mother and fetus.

Hypnosis is one of the oldest methods of psychological analgesia dating back thousands of years ago. The Greeks and Romans used opium, which in some cases was mixed with other plant containing Hyoscine as a systemic method for pain relief in labour (Spielman, 1987).

General anaesthesia can be given by inhalation or by intravenous route as

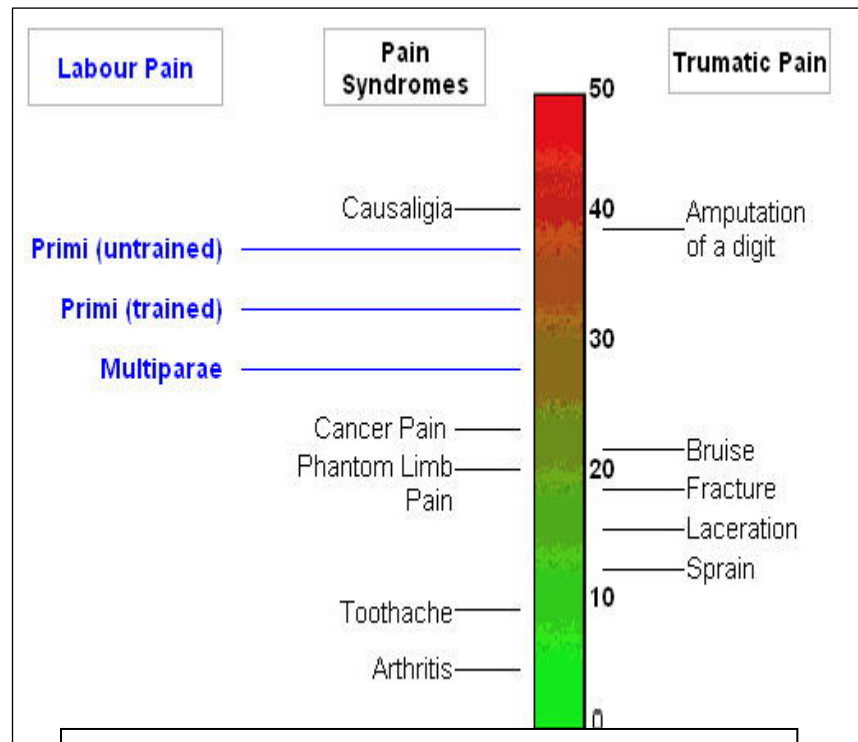


Figure (1): rank of pain severity.

subanaesthetic dose of Ketamine or by use of nitric oxide with oxygen with close supervision so the patient will remain conscious and cooperative.

Regional anaesthesia gained wide use because of its effectiveness and safety.

Lumbar epidural block is widely used as it is the most effective method of pain relief in labour with major advantage of providing prolonged effective analgesia without necessity for narcotics, sedatives or general anaesthetics.

There is no single technique of preparation and of pain relief in labour applicable to every woman. All methods should be available, the patient's wishes should be respected and the choice should be arrived at by the patient, the obstetrician and the anaesthetist in consultation and after evaluation of any obstetric problems.

The aim of this work is to review the scope and meridian of the different methods of pain relief during labour.

**Anatomy
of
the female genital tract**

Anatomy of the female genital tract

➤ **Anatomy of the bony pelvis:**

The bony pelvis is made up of four bones, the two innominates, the sacrum and the coccyx, which are united by four joints. The articulated bony pelvis is divided into false and true pelvis by the pelvic brim or inlet. The false pelvis lies above the pelvic brim and forms the lower boundary of the abdominal cavity, while the true pelvis lies below the pelvic brim and bounds the pelvic cavity and the perineal space (*Kumazawa, 1986*).

The pelvic inlet is bounded by the pubic crest, pubic spine, pectin pubis and ilio-pectineal line of the innominate bone and the anterior border of the ala and the promontory on the sacrum (*Trolle et al., 1991*).

The pelvic cavity is a curved canal with a shallow anterior wall and a deep concave posterior wall. It is bounded by the pubis, the ischium, part of the body of the ilium and by the sacrum and coccyx (*Kumazawa, 1986*).

The pelvic outlet is bounded by the arcuate pubic ligament, and the pubic arch anteriorly, the ischial tuberosities and sacrotuberous ligaments laterally, and the tip of the coccyx posteriorly (*Trolle et al., 1991*).

➤ **Ligaments and joints of the pelvis :**

The pelvic joints are the symphysis pubis, the sacroiliac joints and the sacro-coccygeal joints. The sacroiliac joint is the largest and most important of the pelvic joints since the weight of the body is transmitted through this joint to the lower limbs.

There are four clearly identifiable ligamentous structures in the pelvis the broad ligaments, the round ligaments, the ovarian ligaments and the uterosacral ligaments.

- ***Broad ligaments:***

Each broad ligament consists of a double sheet of peritoneum that extends from the pelvic wall to the lateral surface of the uterus. The broad ligament encircles the fallopian tube at its upper border and continues laterally as the infundibulopelvic ligament. The ovarian vessels and the sympathetic nerves and lymphatic that accompany them traverse this component of the broad ligament toward the tube and ovary.

- ***Round ligaments:***

They are muscular bands arise from the fundus on its lateral aspect. Crossing laterally and anteriorly in the upper broad ligament in a curved fashion, the ligaments exit the pelvic cavity through the internal inguinal ring. Passing through the inguinal canal, then descend into the vulva and spread out in a manlike fashion to fuse with the connective tissue of the labia majora. They are structurally continuous with the ovarian ligaments, serving to connect the lower pole of the ovary to the inguinal canal.

- ***Ovarian ligaments:***

They are cordlike fibromuscular ligaments link the inner and lower pole of the ovary to the cornu of the uterus. Lying within the posterior leaf of the broad ligaments, they are morphologically continuous with the round ligament.

- ***Uterosacral ligaments:***

If the uterus is pulled forward, two folds of peritoneum can be seen to pass backward from the cervicouterine junction to reach the parietal peritoneum lateral to the rectum. The uterosacral ligaments serve as a route for the sympathetic and parasympathetic nervous supply to the pelvic viscera. Their insertion on the sacral wall is at about the junction of the second and third sacral vertebrae.

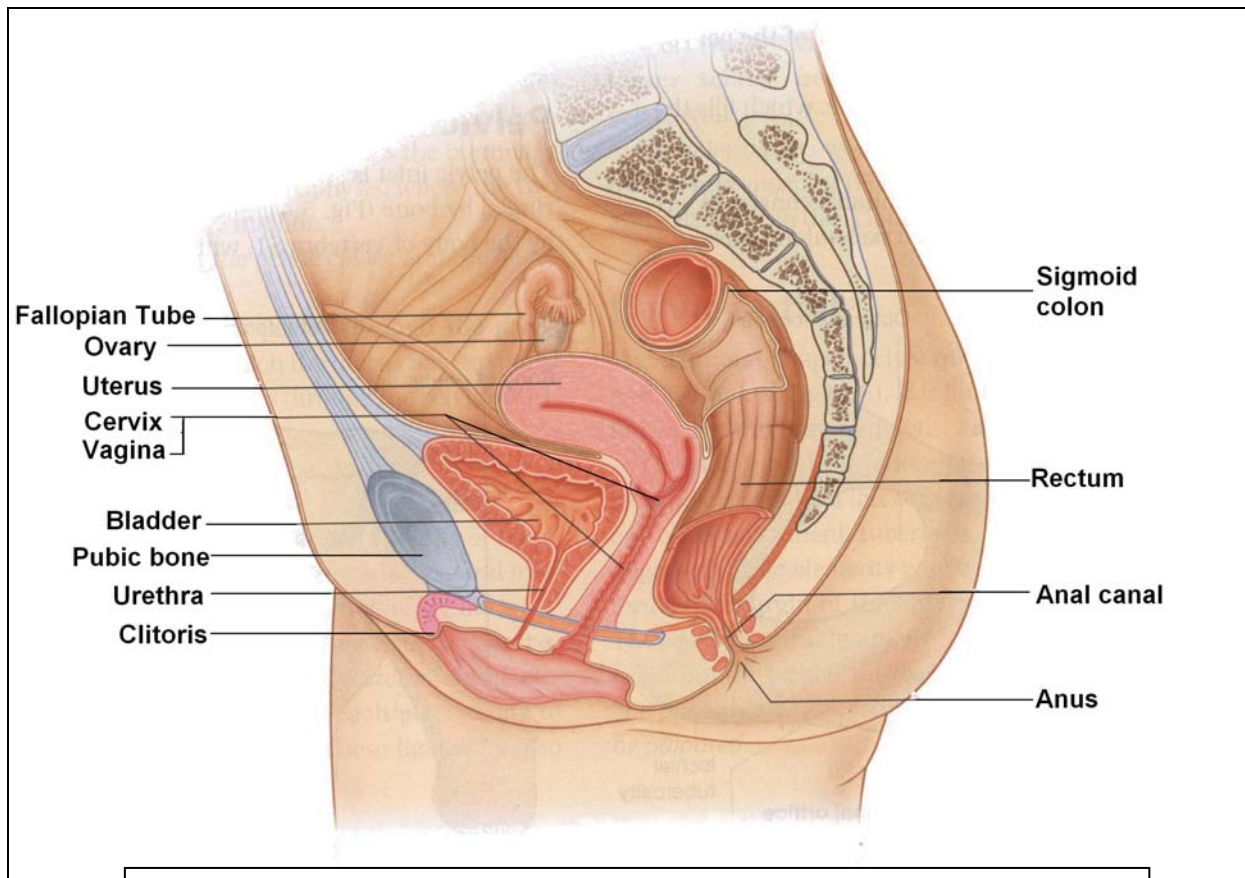


Figure (2): Anatomy of the female genital tract (sagittal view).

➤ **Anatomy of the uterus :**

The uterus is a pear shaped organ. It is covered partially by peritoneum and its cavity lined by endometrium. It is composed of uterine body (isthmus, cornua and fundus) and cervix. The cervix is bounded at the upper end by the internal os and at the lower end by the external os.

The uterus is about 7.5 cm long, 5 cm wide at the fundus, and its walls are about 1.25 cm thick. According to Davis, the virginal uterus weights from 40 to 50 grams and the parous uterus 50 to 70 grams during reproductive life (***Davis, 1933***).

➤ **Anatomy of the vagina :**

It is a tubular musculomembranous structure that extends from the vulva to the uterus. It lies between the urinary bladder and rectum. In virginal women the vaginal opening is hidden by overlapping labia minora and when exposed appears completely closed by membranous hymen which varies in shape and consistency. The vaginal vault is subdivided into the anterior, posterior and two lateral fornices by the uterine cervix. There are prominent ridges that project into the vaginal lumen which are called rugae forming corrugated surface which is gradually obliterated after repeated child birth (*Larsen and Galask, 1980*).

➤ **Anatomy of the perineum :**

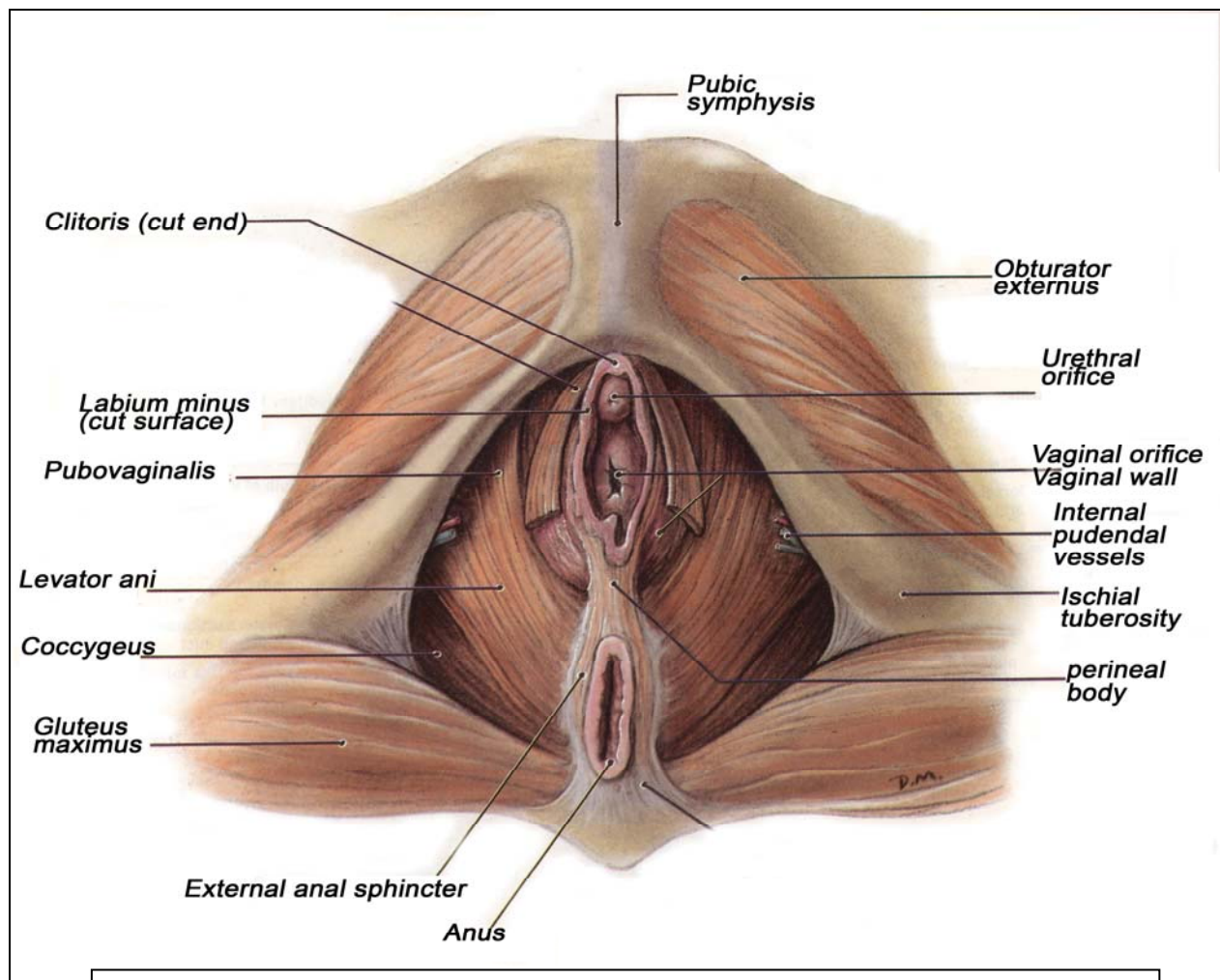


Figure (3): Anatomy of the female perineum.

The pelvic and the urogenital diaphragm support it. The pelvic diaphragm consists of the levator ani muscle and coccygeus. The levator ani muscle originates from the superior rami of pubis, ischial spine and obturator fascia. It is inserted around the vagina and rectum, forming efficient functional sphincters.

Neurology of the female genital organs

The innervation of the birth canal is derived from autonomic nervous system, which consists of sympathetic and parasympathetic nerve fibres, and these fibres are called postganglionic. The preganglionic fibres relay in ganglion cells and originate from the spinal cord and brain stem (*Kumazawa, 1986*).

➤ ***Nerve supply of the female genital tract:***

On the posterior abdominal wall, there is a network of sympathetic fibres, situated in front of the aorta and known as ***the preaortic plexus of intermesenteric nerves***. This plexus is derived from the ***coeliac and renal ganglia***. There are two main strands of nervous tissue running down on either side of the preaortic plexus - derived from the lumbar sympathetic ganglia.

These strands fuse with the preaortic plexus in front of the fifth lumbar vertebra, on the bifurcation of the aorta, behind the peritoneum forming ***the presacral nerve or superior hypogastric plexus***. It consists of a median and two lateral roots.

Between the presacral nerve and the anterior surface of the body of the fifth lumbar vertebra is the median sacral artery, and rupture of this vessel is a common complication of attempts to elevate the plexus (*Davis*).

The presacral nerve or superior hypogastric plexus may retain its identity in the pelvis and passing over the promontory, and in front of the upper part of the sacrum becomes ***the middle hypogastric plexus***. But at varying levels in the pelvic cavity it divides into two parts around the ampulla of the rectum, and becomes known as the ***inferior hypogastric plexus***.

This plexus passes forward in the extraperitoneal connective tissue on the uterosacral ligament and beneath the sacrogenital fold to enter the hypogastric ganglion (*Latarjet*). This structure is sometimes known as ***the ganglion or plexus of Frankenhauser, the lateral cervical plexus, the uterovaginal plexus, the ganglion cervicalis uteri of Lee***, but becoming more commonly referred to by the term ***“the pelvic plexus”*** (*Davis, Curtis et al.*).

It occupies an area 2 cm² bounded **medially** by the rectal ampulla, the supra-vaginal cervix and the lateral vaginal fornix, **laterally** by the uterine artery as it rides on the ureter; **above** by the broad ligament **and below** by the cardinal ligament. The plexus is made up of interlacing nerve fibres containing large numbers of very small, almost microscopic ganglia.

In addition to the nerves derived from the inferior hypogastric plexus, the pelvic plexus receives fibres from the ***sacral sympathetic ganglia*** and parasympathetic fibres from the ***nervi erigentes***. The sympathetic fibres relay in the ganglia, but the parasympathetic fibres merely pass through it to cell stations in the adjacent viscera. From each plexus branches accompany the pelvic blood vessels to the pelvic viscera, supplying the bladder, uterus, part of the tubes and the vagina.

The parasympathetic nerves supplying the pelvic viscera (with the exception of the ovary and the proximal part of the tube) usually originate from the ***anterior roots of the S2, 3, and 4***, but their origin is variable. Of these, the third sacral

nerve makes by far the largest contribution, and branches from the second or fourth sacral nerves may be absent altogether. They leave the main trunks about 1.5 cm. from the sacral foramen as ***the nervi erigentes*** or ***nerves of Gaskell*** and passing along the uterosacral ligament enter the pelvic plexus.

In general it may be said that the pelvis sympathetic nerves inhibit peristalsis, cause the sphincters of the organs to contract, constrict the blood vessels and inhibit glandular secretion. According to ***Curtis et al.***, the pelvic sympathetic nerves are trophic to external genitalia. The parasympathetic nerves are the antagonist of the sympathetic and therefore induce peristalsis, relax sphincters, dilate the blood vessels and stimulate glandular secretion. There are, of course, exceptions to this general rule ***the uterus***.

The innervation of the ovary

The sympathetic and parasympathetic fibres to the ovary and proximal part of the tube pass to these organs ***via the ovarian plexus***. The sympathetic nerves which are vasoconstrictors emerge from the lateral column of grey mater in the spinal cord at the level of T10 since the ovary is developed in that region. They relay either in the renal or ovarian ganglia, or both, before passing with the ovarian vessels ***via the infundibulopelvic fold*** to their destination.

Sympathetic fibres may also reach the ovary ***via the ovarian branch of the uterine artery*** and these originate from the pelvic plexus.

Using fluorescent microscopy, ***Owman et al. (1967)*** demonstrated the presence of fairly large numbers of sympathetic nerves running in all directions in the stroma without any relation to vessels. They also found that a considerable portion of the ovarian vascular system was supplied by loose networks of sympathetic fibres. This they found to be in keeping with a fluorimetric determination of the norepinephrine content of the ovary which was greater than in any other part of the female genital tract.

The parasympathetic nerves are vasodilators and probably originate from those branches of the vagus which contribute to the formation of the celiac ganglion. This theory has a sound embryological basis, for both the ovary and the abdominal ostium of the tube are developed adjacent to the celiac ganglion.

Ovarian pain is usually referred to the abdominal wall just above the centre of the inguinal ligament on one or other side. The ovary is sensitive to pressure such as that caused by bimanual examination or when it has prolapsed into the Pouch of Douglas. It may give rise to dyspareunia. Distension of its capsule may also give rise to pain such as that experienced by some women at the time of ovulation.