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# Pain sensitivity of and pain radiation from the internal female genital organs

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**The aim of this study was to determine the sensitivity and the localization of pain from the internal female genital organs. In 28 women undergoing a ring sterilization, the internal genital organs were pinched with a 3 mm forceps and the pain sensitivity and localization were recorded. Pain localization was vague, and pinching of the medial and distal end of the oviduct, or of the anterior, posterior or left or right uterosacral ligament could not be discriminated. The sensitivity of the pouch of Douglas and of the uterosacrals was greater than of the oviduct, uterus or ovaries. Small typical endometriotic lesions were specifically more painful. The pain from the uterus was felt mainly in the hypogastric region. The oviducts and ovaries radiated mainly to the iliac fossa, whereas pain stimulation of the uterosacrals and pouch of Douglas was felt predominantly in the perineal–perivulvar–perianal region. Radiation to the lower back was rare and never occurred in isolation.**

*Key words:* endometriosis/pain/pain radiation/pelvic pain/visceral pain

## Introduction

The localization and radiation of pain from the internal female genital organs has been clinically established and carefully described for each gynaecological syndrome (Renaer, 1981; Vercellini *et al*., 1990; Messer, 1992; Robinson, 1993). The severity of pain has been related to the severity of disease rather than to the sensitivity of the different internal female genital organs. Radiation of pain also was related to disease rather than to specific organs.

Acute visceral pain was shown to be diffuse in its distribution, relatively vague as to the location of origin and often referred to remote areas of the body (Cervero, 1991; Cervero, 1994). The density of visceral innervation is low, but these few fibres can activate a large number of neurons in the cord through extensive functional divergence. A long-standing discussion about the nature of the visceral nociceptors has recently been settled by the acceptance of several categories of visceral sensory receptors, including high-threshold receptors, 'silent' nociceptors and intensity encoding receptors (Cervero and Janig, 1992).

We recently described a perineal pain in women with deeply infiltrating endometriosis (Koninckx and Martin, 1994; Koninckx *et al*., 1995, 1996). A Medline database search using Silverplatter Winspirs (1980–1996) and Knowledgefinder (1985–1996) search engines confirmed that it was an unusual gynaecological pain radiation. Perineal pain is well documented during labour and following delivery, in cancer-related coccydynia (Saris *et al*., 1986), dorsal meningioma (Pagni and Canavero, 1993), lesions of pudendal nerves (Bensignor *et al*., 1993), sacral cysts (Anonymous, 1991; Van de Kelft and Van Vyve, 1991; Iwasaki *et al*., 1992) and rectum carcinoma (Herrera-Ornelas *et al*., 1986; Radbruch *et al*., 1991; Rodriguez-Bigas *et al*., 1991; Boas *et al*., 1993), whereas perineal pain in gynaecological disease (Thomas *et al*., 1992; Ling and Slocumb, 1993; Milburn *et al*., 1993; Rapkin and Mayer, 1993; Summitt, 1993) and more specifically in adhesions (Steege and Stout, 1991; Peters *et al*., 1992; Monk *et al*., 1994), pelvic congestion (Stones *et al*., 1990; Beard *et al*., 1991), ovarian remnants (Siddall-Allum *et al*., 1994) and endometriosis (Muse, 1988; Fedele *et al*., 1990; Delarue *et al*., 1990; Koninckx *et al*., 1991; Mahmood *et al*., 1991; Vercellini *et al*., 1991; Fedele *et al*., 1992; Ripps and Martin, 1993; Sutton *et al*., 1994; Montanino *et al*., 1995; Waller and Shaw, 1995), was, to the best of our knowledge, never mentioned.

Therefore pain radiation from and localization in the female pelvic organs, and their sensitivity, were prospectively investigated.

## Materials and methods

### *Patients*

Women ($n$ = 28) scheduled for a ring sterilization under local anaesthesia were investigated. Informed consent was obtained and they were instructed about the procedure. Following the introduction of an operative laparoscope, the genital organs were pinched with a 3 mm grasping forceps and the women were asked to score the intensity of the pain and to describe carefully its localization. All observations were made by one observer (P.R.K.). By combining the pinching pressure exerted and the pain score of the women, pain sensitivity was graded from 0 to 5. When after strong pressure no or only slight pain was felt, the sensitivity was scored 0 or 1; when, however, a slight pinching pressure caused such a severe pain that exerting more pinching pressure was prohibited, the sensitivity was scored as 5. This method of scoring was necessary as it was felt unethical to use a standard pressure in all places, since this would inflict severe pain in some women. Indeed, in some places the slightest pinching pressure could induce rather severe pain, whereas in other places, even a severe pinching pressure was hardly felt. Localization of pain was recorded in a blind and non-suggestive way since women were unaware of the organ which was pinched, and since no localizations were suggested. The pain localizations recorded

**Table I.** Radiation of pain from internal female genital organs. Values are percentages

| | Uterus ($n$ = 24) | Oviduct ($n$ = 77) | Ovary ($n$ = 26) | Uterosacrals ($n$ = 84) | Pouch of Douglas ($n$ = 15) |
|---|---|---|---|---|---|
| Fossa ovarica | 4.2 | 74 | 80.8 | 0.0 | 0 |
| Hypogastric | 66.7 | 15.6 | 0.0 | 35.7 | 6.7 |
| Back | 4.2 | 6.5 | 3.9 | 2.4 | 6.7 |
| Vulvar | 4.2 | 2.6 | 0.0 | 2.4 | 0.0 |
| Perineal | 4.2 | 1.3 | 7.7 | 45.2 | 66.7 |
| Perianal | 8.8 | 0.0 | 7.7 | 14.3 | 20.0 |

comprised the middle part of the lower abdomen (hypogastrium), the left or right iliac fossa, the lower back and the perineal–perianal–perivulvar region. Not a single occurrence of pain radiation to the legs was noted.

The organs selected to evaluate sensitivity and pain radiation were, in random order, the fundus of the uterus, the left and right ovary, the anterior part of the left and right uterosacral ligament, the distal part of the left and right oviduct and the pouch of Douglas. When women were too anxious during the procedure, some localizations were skipped in order to shorten the procedure. In order to evaluate the discriminatory ability in more detail the medial and distal part of the oviducts, and the anterior and posterior part of the uterosacral ligaments were investigated in addition in four women.

In four women small (<5 mm diameter) typical black 'powder-burn' lesions were seen on the uterosacral ligament ($n$ = 3) and in the pouch of Douglas ($n$ = 1), and these were specifically evaluated for pain sensitivity and radiation. Since this was not within the scope of the study, these women had not been scrutinized for the presence of non-pigmented 'subtle' lesions; these lesions were not recorded and pain sensitivity and radiation was not evaluated.

### *Sterilization procedure*

All women were admitted in the morning and were fasting. They received 10 mg of pethidine (Dipidolor$^{TM}$) i.m. 15 min before surgery. The umbilical region was anaesthetized by 10 ml of 1% xylocaine, and the pneumoperitoneum was initiated with $N_2O$ at a flow rate of 1–2 l/min.

### *Statistics*

Statistical significance was calculated with the SAS program (SAS, 1985) and the following tests were used when appropriate: Spearman and Pearson correlations, paired $t$-test, $\chi^2$-test and Mann–Whitney test when the data were not normally distributed. All observations were treated as independent observations, even when made in the same patients.

## Results

Pain discriminatory ability was poor. Not a single woman could distinguish between the medial and lateral part of the oviduct ($n$ = 4), nor between the anterior or posterior part of the uterosacrals ($n$ = 4), nor between the left or right uterosacral ($n$ = 16). Pinching the left or right oviduct or ovary caused symmetrical pain in the right or left iliac fossa respectively. Therefore in the further analysis, data from uterosacrals and oviducts and ovaries have been combined.

As expected, pain from the uterus was generally felt in the hypogastric region, whereas the oviductal and the ovarian pain was felt more laterally in the ileac fossa (Table I). Rather

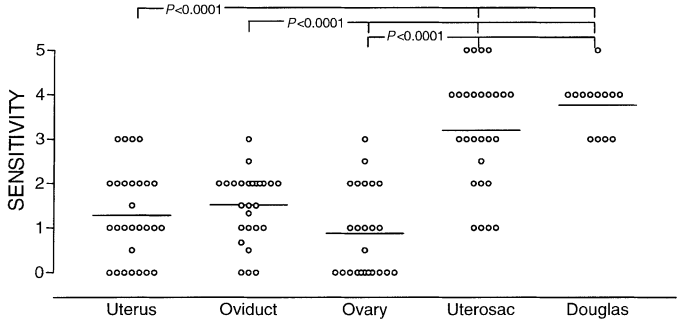


**Figure 1.** Pain sensitivity (0 to 5) of female internal genital organs. The scoring in each individual woman (mean of the sensitivity of several radiations when present), the mean values (shown by horizontal bar) and significant differences are indicated.

unexpected were the following observations. The pain from the uterus was occasionally felt in an iliac fossa, the lower back, and in 17.2% in the perineal–perivulvar–perianal region. The pain from ovaries and oviducts was felt in the perineal–perivulvar–perianal region in 15% and 4% respectively. The pain from the pouch of Douglas and the uterosacrals was even felt predominantly in the perineal–perivulvar–perianal region, i.e. in 86.7% and 61.9% of patients respectively. Pain in the lower back could only occasionally be induced. Even by pinching the uterosacrals or the pouch of Douglas posteriorly, pain in the lower back could not be induced systematically.

The pain intensity was higher ($P < 0.0001$) when the pouch of Douglas or uterosacrals were stimulated than following stimulation of uterus, oviducts or ovaries (Figure 1). The oviducts were slightly more sensitive than the ovaries ($P < 0.0001$).

We expected that pain sensitivities would be related to the overall sensitivity of the women and that pain sensitivities of the different organs would thus be interrelated. The strongest correlations were found between the sensitivities of the uterus and oviduct (Spearman, $P = 0.0076$; Pearson $r = 0.452$, $P = 0.016$) and between the uterosacrals and the pouch of Douglas (Spearman, $P = 0.0001$; Pearson $r = 0.722$, $P = 0.0001$). Otherwise, only the sensitivities of the uterosacrals and the oviduct (Spearman, $P = 0.02$; Pearson $r = 0.425$, $P = 0.02$) were correlated.

All four typical endometriosis lesions were so sensitive that pain intensity could not be scored adequately in these four women. Although the lesions were more sensitive than adjacent regions, radiation of pain from them was similar.

## Discussion

These observations should be interpreted with caution since the pain stimulus was an unphysiological pure mechanical stimulus of low intensity, applied superficially and for a rather short duration. Moreover, the women had received a pethidine injection and $N_2O$ was used for the pneumoperitoneum, and the scoring of the pain sensitivity was obviously subjective. The fact that the pain sensitivities of the different pelvic organs were not systematically interrelated suggests, however, that the scoring was at least not systematically biased by the overall pain sensitivity of the women or the perception of the observer.

Discrimination of a stimulus applied to the medial and lateral part of the oviduct or to the anterior or posterior part of the uterosacrals was not possible. Discrimination between oviduct and ovary is poor. Localization of pain is consistently described as vague and is only slightly lateralized. This is not surprising, and is comparable with the vague visceral pain localization as reviewed by Cervero (Cervero, 1988, 1991, 1994, 1995; Cervero and Janig, 1992): gastrointestinal pain is often dull, aching, ill-defined and badly localized, and in some cases, gastrointestinal pain is projected to areas of the body away from the originating viscus ('referred' pain), suggesting that the representation of internal organs within the central nervous system is very imprecise; moreover, the few nociceptive afferents contained in sympathetic nerves can excite many second order neurones in the spinal cord which in turn generate extensive divergence within the spinal cord and brain stem, sometimes involving long supraspinal loops; such a divergent input can activate many different systems, motor and autonomic as well as sensory, and thus trigger the general reactions that are characteristic of visceral nociception: a diffuse and ill-localized pain sometimes referred to somatic areas.

Some pain localizations are surprising. Whereas the localization in the hypogastric region and in the iliac fossa were anticipated, a radiation towards the thigh was never mentioned, and a radiation towards the back was only rarely found, even when the uterosacrals or pouch of Douglas were stimulated posteriorly with the specific intention to induce back pain. This observation confirms the statement of McNab and McCullock (1990) and the clinical experience (Renaer, 1981) that 'the isolated symptom backache, is rarely the only symptom of visceral disease'. Also the absence of pain radiation to the upper part of the legs is surprising since this is clinically seen associated with ovarian pathology. The absence of these pain radiations could, however, be explained by the fact that these experiments induced acute visceral pain only, whereas pain from clinical syndromes should probably be regarded as chronic pain, i.e. with the activation of 'silent' nociceptors (Cervero and Janig, 1992). The high incidence of perineal, perianal and perivulvar pain localizations are surprising since they are rarely mentioned in the clinical gynaecological literature. The high incidence of these pain radiations when the pouch of Douglas or the uterosacrals are stimulated is apparently in contradiction with the clinical experience, where this symptom is rarely mentioned even in women with extensive peritoneal disease such as endometriosis. This pain radiation, however, is consistent with our observation in deeply infiltrating endometriosis (Koninckx and Martin, 1994; Koninckx *et al*., 1995, 1996). It is important to recognize this pain as gynaecological since perineal pain was reported by Gatt (1995) 'to be based on an excess of nociception and deafferentation, whereas chronicisation depends on neurotic characters and on psychiatric pathology'.

Differences in pain sensitivity were highly significant, the uterosacral and pouch of Douglas being the most sensitive, the ovary being the least sensitive. The high incidence of virtual absence of pain sensitivity of ovaries and uterus confirms the clinical experience that an ovary, e.g. when punctured, can be surprisingly insensitive and also that a cervix when grasped with a tenaculum can occasionally be almost insensitive. This is compatible with a low density of nerve endings (Cervero, 1991) so that some points can be more or less sensitive than adjacent ones.

Even small typical endometriotic lesions were exquisitely sensitive, although these women did not report substantial spontaneous pain. Although this observation should be considered as preliminary, it suggests the activation of 'silent' nociceptors by the inflammation surrounding the endometriotic implant. This could have far-reaching implications for our understanding of the clinical symptoms of minimal and mild endometriosis. Minimal and mild endometriosis can be considered as a normal condition, occurring intermittently in all women (Koninckx, 1994; Koninckx *et al*., 1994), and it remains debatable whether they are a cause of infertility and of pelvic pain. The concept of activation of 'silent' nociceptors, and the associated central hyperexcitability and the increased excitability of somatic and visceral reflexes are speculative. They could, however, not only explain pain conditions such as irritable bowel syndrome, but could theoretically also be a mechanism mediating such poorly understood conditions as the luteinized unruptured follicle syndrome (Koninckx *et al*., 1980). They could, moreover, reconcile the apparently conflicting observations that minimal endometriosis does not necessarily cause pelvic pain whereas women with chronic pelvic pain have a high incidence of (minimal) endometriosis (Koninckx *et al*., 1991; Moen 1995; Kennedy *et al*., 1996; Balasch *et al*., 1996).

In conclusion, although the unphysiological pure mechanical stimulus that was used in this study could cast doubt on the clinical implications of these observations, our data confirm that pain localization of the genitalia is vague, as was observed for visceral pain. The perineal pain radiation is considered important since it is also observed clinically in deep endometriosis. The specific sensitivity of uterosacrals and the pouch of Douglas — at least in some women — and of endometriotic spots, seems to confirm clinical observations, whereas the absence of pain radiation to the lower back is surprising, and could be related to the type/duration of the stimulus applied.

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