

Review Article

Dyspareunia Due to Endometriosis

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Abstract

Endometriosis is a common cause of deep dyspareunia presenting in young women but is also associated with uterine adenomyosis in older women often as a secondary symptom to pelvic pain and dysmenorrhea. Diagnosis is by laparoscopic examination and as this is an invasive procedure may be delayed. Laparoscopy for pelvic pain should be carried out by specialist surgeons who are in a position to both properly stage the disease and if appropriate carry out definitive surgery at the same procedure to avoid repeated surgical interventions. Treatment is aimed at removing the endometriotic deposits with minimal damage to adjacent or underlying structures and various modalities can be employed. The results of 2 randomized studies point to the efficacy of ablative therapy for this troubling condition.

INTRODUCTION

The most painful type of dyspareunia causing pain on deep penetration during sexual intercourse is usually due to endometriosis which is a complex inflammatory condition among women of reproductive age with a prevalence of 10 - 15% [1]. The disease can take several different subtypes: superficial endometriosis (Figure 1), ovarian endometriosis (endometrioma) (Figure 2), and Deep Infiltrating Endometriosis (DIE) (Figure 3), although all types can co-exist in the same patient. The contemporary definition of DIE is endometrial glands and stroma in fibromuscular tissue (adenoma externa) with the bowel being involved in 5% to 10% of patients affected [2].

Deep dyspareunia is particularly likely to occur if there are active deposits of endometriosis on the peritoneal surface of the cul-de-sac at the peritoneal reflection, as the rectum leaves the peritoneal cavity, which is the area at the top of the vagina which comes into contact with the tip of the penis particularly in coital positions that allow deep penetration. Women often complain of "something being hit" which can be sufficiently severe to have to stop intercourse or, increasingly, to avoid it altogether which can lead to sexual disharmony and a possible increased divorce rate among endometriosis patients.

CLINICAL PRESENTATION, EXAMINATION AND IMAGING

Deep dyspareunia unlike superficial dyspareunia is usually of insidious onset either in the older or the younger age group. Careful history taking and clinical examination will often point to a cause which will then need appropriate investigation. Immediate referral for community trans-vaginal ultra-sound examination is not appropriate as it has a very low sensitivity in

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detecting either superficial or deep endometriosis, though has a high sensitivity for ovarian endometriomas, which although not necessarily painful in their own right are markers for deep infiltrating endometriotic plaques. Ultra-sound examination is however useful for screening out other pathology such as ovarian neoplasia which can be easily missed until too late for effective treatment and uterine fibroids.

The main differential diagnosis of pelvic pain rests between chronic inflammatory conditions such as endometriosis and infective pathology leading to pelvic inflammatory disease which can be post-abortion or sexually acquired. Pelvic inflammatory disease is beyond the scope of this article but needs appropriate examination, testing and vigorous treatment to prevent damage to the fallopian tubes leading to infertility and increased risk of ectopic pregnancy.

In older women the insidious onset of pelvic pain and deep dyspareunia may be cyclical, typically occurring later in the menstrual cycle. Associated symptoms are pelvic ache, menstrual pain and increasing menorrhagia. Women will typically complain of post-coital pain lasting for 24 hours. Clinical examination is often more useful than ultra-sound or other imaging modalities, a fixed retroverted bulky tender uterus being very suggestive of uterine adenomyosis. The initial management of this is usually medical and based on the use of oral progestogens or progesterone eluting intra-uterine devices. Many women however are unable to tolerate the effects of progestogens, fluid retention, weight gain and breast tenderness together with unwanted androgen effects that they commonly request a hysterectomy.

Careful history taking is important too in trying both to understand the symptoms and reach a diagnosis. It can take many visits to general practitioners, clinics for sexually transmitted

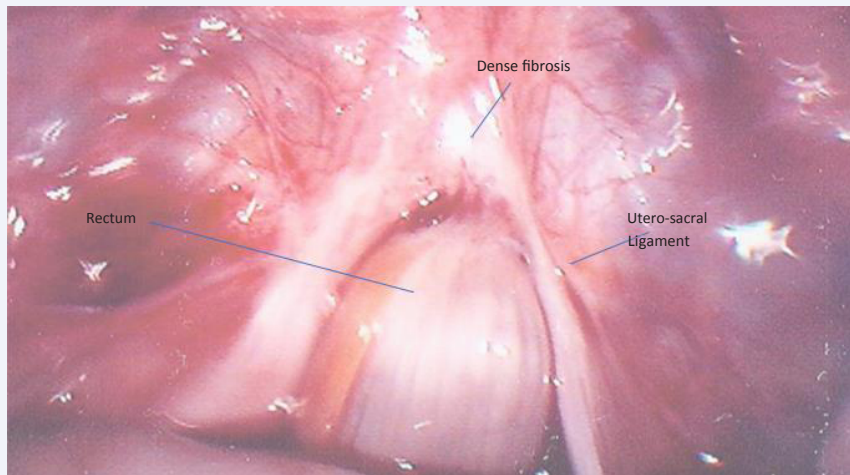
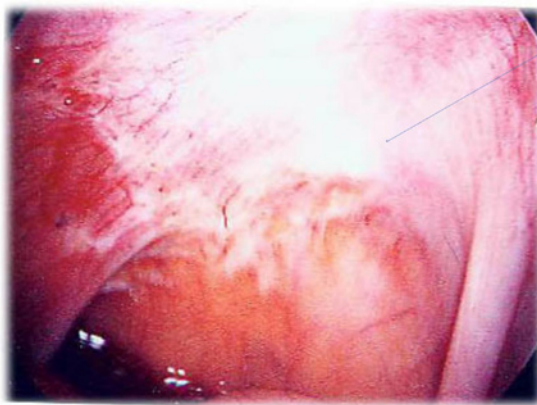
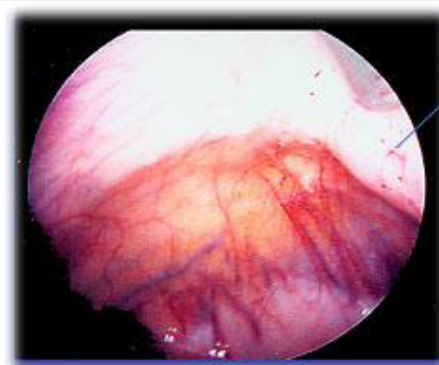


Figure 1 Superficial Endometriosis.



Extensive superficial endometriosis



Uterosacral

Figure 2 Ovarian Endometriosis (Endometrioma).

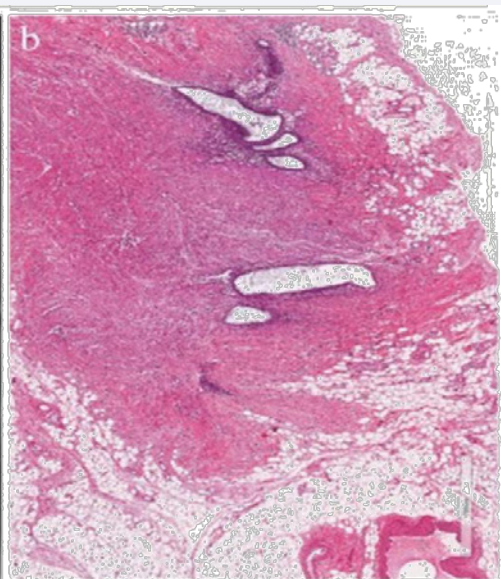


Figure 3 Deep Infiltrating Endometriosis (DIE).

diseases and general gynaecologists before a diagnosis is made, for young women with pelvic pain and dyspareunia the average time for a diagnosis of endometriosis to be made is more than 4 years. In addition to the universal symptoms of pelvic pain and severe dysmenorrhoea women with deep infiltrating endometriosis will often complain of severe peri-menstrual backache, pain radiating down to the knee, from obturator nerve inflammation and perimenstrual dyschezia (painful defaecation) which they may be reluctant to volunteer as a symptom. This can be associated with menstrual rectal bleeding a sign of possible rectal involvement. Clinical examination is important in establishing the initial diagnosis and needs to be approached gently as if you cause immediate pain the rest of the examination will not reveal anything.

Initial examination pelvic examination should include palpation of the utero-sacral ligaments for areas of tenderness and nodularity. The posterior cul de sac (pouch of Douglas) may also be tender and a plaque of endometriosis may be detected which will usually be exquisitely tender. It can infiltrate the vaginal epithelium which may be hard and fixed. It may be very difficult to palpate the cervix as the uterus can be pulled out of the pelvis by the fibrotic endometriotic disease. If you are able to reach the cervix, cervical excitation pain is common. On questioning, women with these findings will frequently report that they have found cervical cytology testing very painful and that the examiner has had great difficulty visualizing the cervix.

Although not a particularly useful screening tool specialist trans-vaginal ultra-sound and magnetic resonance screening (MRI) are important tools to further stage the disease so that an appropriate care plan can be developed. It is important to establish whether the vaginal mucosa is involved and crucially whether there is involvement of the rectal muscularis, typically at the recto-sigmoid junction as the rectum leaves the peritoneal cavity. The signs are however subtle and need to be assessed in expert centres with appropriate expertise as they are easily missed.

SUPERFICIAL PERITONEAL ENDOMETRIOSIS

The diagnosis of endometriosis can only be made with certainty by laparoscopic examination of the pelvis and abdomen. This in part explains why the diagnostic process is lengthy as this carries significant implications for the patient; it is an invasive procedure carried out under general anaesthesia and carries a small but significant risk of inadvertent bowel or vascular injury. It is therefore vital that the assessment laparoscopy is performed by a gynaecologist who is aware of the various different appearances of the disease rather than someone who is merely looking for haemosiderin deposits on the peritoneal surface which often represents burnt-out or inactive disease.

Jansen and Russell [3], described a variety of non pigmented lesions including white opacified peritoneum that resembles vesicles or sago-grains, red flame-like telangiectatic lesions and glandular lesions with an appearance similar to that of endometrium seen at hysteroscopy. They showed endometrial glands and stroma on histological examination of peritoneal biopsies from these active appearances in 67 - 81% of cases and also described other appearances such as sub ovarian adhesions,

yellow brown peritoneum and peritoneal defects which had endometriosis present and other active lesions showing abnormal vasculature suggesting active neo-angiogenesis.

All of these lesions need to be removed completely by an energy source that causes limited damage to surrounding normal tissue and that can be used safely at the same time as the diagnostic laparoscopy.

TREATMENT BY LAPAROSCOPIC SURGERY

In October 1982 the carbon dioxide laser was used for the first time in the UK at the Royal Surrey County Hospital in Guildford to destroy these peritoneal lesions by laparoscopic surgery. This energy source was chosen because it was possible to precisely vapourise these lesions layer by layer until retroperitoneal fat appeared which has a distinctive appearance and the high water content absorbs laser energy at this wavelength thus preventing the laser beam from further vapourisation of normal tissue. Nowadays a laser may seem to be a complicated and expensive device to use as the power source for laparoscopic surgery but this was 32 years ago when scissors were re-useable and often blunt and many accidents were reported with stray current damaging adjacent structures whilst using electrosurgery to the extent that it was banned in Germany.

The carbon dioxide laser is an invisible light laser with a long wavelength 10.6 00 nm that produces only excitational and rotational energy in tissue that results in rapid boiling of cell contents by the process known as vapourisation. Water in the tissue adjacent to the impact zone absorbs any remaining laser energy and therefore acts as an insulator and limits the zone of irreversible cellular damage to 300 - 500 um which can be reduced to as little as 50um using an ultra pulse laser [4,5].

The laser beam is transmitted from the laser generator via a series of mirrors through the operating laparoscope or via a second cannula sited in the right or left iliac fossa after identifying the course of the inferior epigastric artery and vein and avoiding damage to them when introducing the sharp trocar. Since the CO2 laser beam is invisible it is necessary to use a red helium-neon laser to act as an aiming beam and as long as the laser is only activated when this is on a safe structure this makes it extremely safe.

ELECTROSURGERY

Electrosurgery remains the mainstay of treatment modalities as it is cheap and easily available. Modern electro-surgical generators and the use of disposable well insulated instruments with small precise electrodes has improved safety considerably. The electrodes can be used either to excise tissue allowing re-peritonealisation to occur and the tissue to be sent for confirmatory histological assessment or to coagulate the tissue, which is easier, but the resulting eschar will fibrose and may be the source of adhesions. Some surgeons prefer the use of bipolar electricity which is spark free and is useful to stop any inadvertent bleeding. Although predominantly safe electrosurgery continues to have problems with uncertain depth of penetration, transmission of current by sparking into adjacent structures and heat injury.

NEWER ENERGY SOURCES

In recent years many new devices have been introduced partly due to advances in scientific technology but also driven by the understandable commercial need to encourage the use of single use products that generate more profit than reusable scissors or electrosurgical needles. They have been reviewed in detail [6,7], and include the Argon Beam Coagulator, the Helica thermal coagulator, the cold plasma coagulator, Helium Plasma Devices and Fluid-Coupled Electrosurgical Devices but only two will be considered here since they are the most useful of the newer power sources for the treatment of deep dyspareunia associated with endometriosis.

ULTRASONIC (HARMONIC) SCALPEL

The ultrasonic vibrating scalpel uses sound energy to vibrate the tissue cutting blade to 55,500 vibrations per second, thereby dividing the intended tissue via generation of low heat, which when combined with rapid vibration causes proteins to denature. This coagulum seals vessels of up to 5mm in diameter and results in minimal bleeding, lateral thermal spread or smoke production. These physical properties make it an excellent instrument for use in advanced laparoscopic procedures and is an effective way of dissecting out the excessive deeply infiltrating fibromuscular tissue of the utero-sacral ligaments due to endometriosis which is one of the leading causes of deep dyspareunia.

To the inexperienced observer these fibrous utero-sacral ligaments which fuse at the back of the cervix do not show any or only minimal macroscopic evidence of endometriosis but Nisolle showed in 1988 that when examined histologically 52% of cases show endometrial glands and stroma [8]. Treatment of the superficial deposits only is insufficient to treat any dyspareunia due to endometriosis.

Therefore division of the entire utero-sacral ligament complex is required to treat this cause of deep dyspareunia.

PLASMAJET

This device originated as an offshoot of the Russian Space Program in Siberia and utilizes argon neutral plasma energy, which can be delivered laparoscopically down a 5 mm handpiece which is single use and disposable. The Plasma Generator can be rented for each patient which makes hospital administrative accounting much easier rather than investing in huge capital expenditure.

The pure thermal plasma flow has a substantial advantage in terms of safety and minimal damage to adjacent and underlying tissues. The system is electrically neutral, and because it carries no external electrical current, no ground pad is necessary and there is no risk of alternate-site burns. The word plasma in this sense has nothing to do with the bodily fluid but describes ionized gas, the fourth state of matter after solid, liquid and gas when energy is added to a solid, it melts to form a liquid, and if more heat is added, the liquid evaporates to form a gas. If further energy is applied it ionizes and becomes a plasma which is inherently unstable and gives up its energy in three useful forms for the laparoscopic surgeon: as light that illuminates the target area, as heat that may be used to coagulate a tissue surface and seal small vessels and as kinetic energy that may be used

to vapourise tissues of various densities including the fibrosis associated with deep infiltrating endometriosis and even bone.

The PlasmaJet is easy to use and creates no problems for the technical or nursing staff in the operating theatre and is arguably the only true plasma surgical device available today because it does not use an electrosurgical approach and is effective at cutting, coagulation and ablation. This device has been evaluated clinically in the United States by Nezhat al [9], and in the United Kingdom in our Department at the Royal Surrey County Hospital in the treatment of endometriosis [10], and in France by Roman et al. [11], who compared plasma ablation of ovarian endometriomas with cystectomy and found better preservation of the ovarian parenchyma in the group that received plasma therapy.

In Guildford we compared the tissue effect of the PlasmaJet and found it to be almost the same as the carbon dioxide laser.

The ergonomically designed handpiece is comfortable and easy to use and there are no associated technical problems, but it is single use and disposable.

OVARIAN ENDOMETRIOMAS (CHOCOLATE CYSTS)

There is considerable controversy over the pathogenesis of ovarian endometriomas. As long ago as 1957 Hughesdon, a gynaecological pathologist working at University College Hospital in London, suggested that bleeding from endometriosis implants on the posterior surface of the ovary caused the ovary to adhere to the peritoneum of the ovarian fossa and since the blood could not escape it was trapped in that situation and therefore caused invagination of the ovarian cortex [12], and the inside of the endometrioma fills with old blood and haemosiderin and requires careful dissection with a probe, laparoscopic scissors and aqua dissection and once opened there is a release of fluid that resembles chocolate sauce. These endometriomas when adherent to the peritoneum just above the pouch of Douglas can cause severe dyspareunia and need to be treated. The practical significance of this is that it is pointless to try and strip out the capsule and then stop the bleeding with bipolar coagulation because one is merely attempting to strip out the ovarian cortex and the heat will destroy the primordial follicles that can be seen on microscopy to lie just underneath the surface.

The best energy source to remove the cyst lining with minimal damage to the developing follicles is the green light KTP (Potassium-Titanyl-Phosphate) laser which at this wavelength of 532nm will work in the presence of blood but will only penetrate a few millimetres beneath the surface [13,14].

Unfortunately the carbon dioxide will not work effectively in the presence of blood so if this is the only laser available the fluid from the endometrioma has to be aspirated and then any further bleeding is suppressed by a three month course of gonadotrophin releasing hormones after which time the shrunken endometrioma with a relatively avascular capsule is vapourised with the carbon dioxide laser which causes little, if any, damage to the developing follicles under the fibrous surface of the capsule [15].

The carbon dioxide laser was first used as an energy source for laparoscopic surgery at St. Luke's Hospital in Guildford

in October 1982 and was used mainly for the treatment of endometriosis and adhesions causing pain and infertility. Due to the large number of referrals from other hospitals for the treatment of large endometriomas we purchased a KTP/532 laser which was also used for hysteroscopic surgery.

In 1997 we reported our experience over 10 years the results using both these lasers of treating large endometriosis (over 6cm in diameter) with both of these lasers on 165 women complaining of pain and/or infertility. Of 122 patients 90 (74%) reported improvement or complete resolution of their non-menstrual pain and dysmenorrhoea and 30 out of 66 patients trying to conceive achieved a pregnancy, giving a cumulative conception rate of 45% and most of the pregnancies occurred within the first eight months following the procedure. The best results were in patients complaining of deep dyspareunia which, of course, can be implicated in difficulty in getting pregnant.

DEEP INFILTRATING ENDOMETRIOSIS

The surgical management of deep infiltrating endometriosis requires extirpation of the fibrotic disease which can be vapourised or excised but can involve excision of the posterior cul de sac and utero-sacral ligaments. Although rectal mucosal sparing procedures are described and were common, musculo-serosal repair is difficult and leaks occasionally occurred which can lead to a pelvic abscess. The fibrotic nature of the disease spreads on to the low pelvic side walls with no obvious tissue planes and requires a difficult dissection which may lead to either heat damage or division of major vessels or the ureter. Many such procedures are now undertaken as joint procedures with other surgical specialists, usually colorectal surgeons who prefer rectal resection for fibrotic lesions involving the recto-sigmoid junction in a similar way to the management of rectal neoplasia but without the need for meso-rectal resection. For a young woman with a benign, though painful condition this is a major procedure and not without short term or long-term consequences. In the short term the biggest risk is of an anastomotic breakdown, pelvic abscess and fistula formation with potentially disastrous consequences for future fertility. In the long term the shortened rectum and possible stenosis may result in problems with rectal frequency and urgency. Long term retention of urine (Mendelson's syndrome) following damage to the sympathetic and parasympathetic plexus can also occur.

There is considerable enthusiasm for this major extirpative surgery, which would usually be reserved for cases of malignancy, in specialist centres, but it should not be entered into lightly and requires detailed counselling and discussion. Complete relief of symptoms is unusual and the majority of women with deep infiltrating endometriosis are likely to have several surgical episodes. There is an association with uterine adenomyosis so often eventually a hysterectomy will be offered. The evidence base for radical surgery for endometriosis is largely based on case series from enthusiasts so needs to be approached with caution, however currently it remains the mainstay of treatment. Other than long term medical therapy or the use of analgesia there is currently no alternative and it is unlikely that there will be funding for the large-scale clinical trials that would be necessary to show a real effect. Co-operation to collect large data bases should be able to show whether there is a long-term

benefit to this very radical surgery and to pick up on long term morbidity but are difficult to maintain and follow up in a young and socially mobile population. Endometriosis is however a long-term condition which with all the manifestations in terms of both pain and fertility requires long term management similar to that of other chronic inflammatory conditions such as Crohn's disease or ulcerative colitis.

SCIENTIFIC EVALUATION OF RESULTS OF TREATMENT

When the carbon dioxide laser was used for the first time in Guildford in 1982 we genuinely thought that we were the first hospital to use it as an energy source for laparoscopic surgery but to our chagrin found that it had been used by the team led by Professor Bruhat in Clermont-Ferrand in France but they had abandoned it in favor of electrosurgery because they found that it was too cumbersome and with their equipment they had problems with the mirrors and alignment of the laser beam. We also read an article in a medical journal describing the initial use laser laparoscopy by Daniell working in Nashville describing a slightly different technique which he had developed at the same time as ourselves [17].

Although we had many years' experience in the use of the laser to treat cervical intraepithelial neoplasia and had been impressed by the near perfect healing of the laser crater we were concerned about the safety of using the laser inside the abdominal cavity in view of the proximity of the bowel and other vital structures.

We submitted the results of our first 100 cases but it was in a journal only read by laser surgeons [18], and was turned down on the basis that it was such a new technology that it would only be considered for publication by a major international journal after 5 years of follow up. We therefore followed our first 228 patients over five years and at the end of that time 126 of the 187 patients suffering from pain (70%) were pain-free. Of the 56 patients with infertility due to endometriosis alone, 45 became pregnant usually within three months of the procedure giving a pregnancy rate of 80% [19].

During the 1980s several centres in Europe and the United States reported the effectiveness of various lasers in relieving the pain of endometriosis in 60 -70% of women following vapourisation of superficial endometriosis with various lasers [20,21].

The surgical treatment of endometriosis is an area that has been notorious for the poor standard of clinical research judged by accepted scientific standards [22]. Most of the reported series have been retrospective as was the one cited above and, although it is difficult to argue with the conception rate, the relief of pain is a highly subjective phenomenon and it is entirely possible that patients can claim pain relief in order to please the surgeon.

The only way that this issue could be resolved was to perform a randomised control trial (RCT), which had to be prospective, and also had to be double-blind so that neither the patient nor the nurse following up the patient was aware that intervention had occurred in the form of laser surgery or whether the intervention was merely a diagnostic laparoscopy with removal of the sero-

sanguinous fluid that is present in most endometriosis patients in order to get a complete view of the peritoneum covering the pelvic cavity.

This study was performed at the Royal Surrey county hospital and published in 1992 and is a landmark study [23-25]. Of the 74 women recruited, 60 completed follow up of whom 62% in the treatment arm were improved using a visual analogue scale compared to 22.6% in the 'sham' arm a statistically significant result, although there is clearly a strong placebo effect from the laparoscopy. It was apparent in this study that the effect of treatment was stronger in those who had more severe disease. A subsequent study showed similar results and also included Stage IV, the most advanced disease and questions on quality of life and this study showed a strong improvement of all the symptoms but by far the best results were for deep dyspareunia 920).

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