

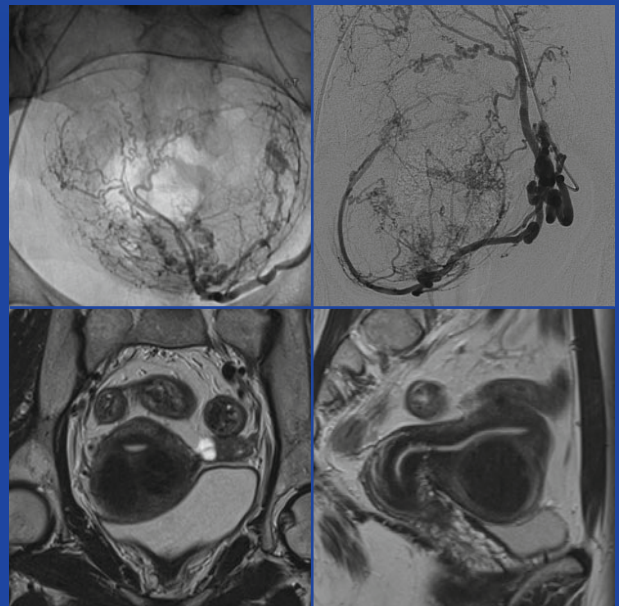
Medical Radiology

Diagnostic Imaging

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H.-U. Kauczor
H. Hricak
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Nigel Hacking
Bruce McLucas
Editors

Radiological Interventions in Obstetrics and Gynaecology



Medical Radiology

Diagnostic Imaging

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Radiological Interventions in Obstetrics and Gynaecology

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For NOC

—John Reidy

Foreword

Embolization of Uterine Myoma

In the last few decades, interventional radiology has revealed many unexpected therapeutic possibilities, and is now developing worldwide. In obstetrics and gynecology, arterial embolization is the most widely used procedure; its efficacy was proven first in the treatment of post-partum hemorrhage, then of uterine myoma. We had the opportunity to participate in the development of these treatments—a wonderful scientific adventure indeed. This opportunity was the result of the fortuitous meeting of two medical teams conducting apparently unrelated activities. When I joined the Lariboisière Hospital's maternity ward in 1988, I met J. J. Merland, chief of the interventional neuroradiology department. He convinced me that there was a role for embolization in the treatment of post-partum hemorrhage. Brown and Païs had initiated the technique in 1979–80, but few had followed their footsteps. From 1988 to 1990, we became convinced of the great efficacy of embolization; at this time, we were the only hospital in France to offer this life-saving treatment, day and night. The credit goes to J. J. Merland's team, whose skills and availability were essential in dealing with this unpredictable emergency. We then took on the challenge to spread the word, at first facing indifference, then a growing worldwide support for this technique.

We first took an interest in uterine myoma in the 1990s, by studying their vascularization, previously described by Sampson (1912). In 1994, we presented the first fibroid arteriogram, at the European Society of Gynecology Congress in Dublin. The poster received an award. Our main concern then was to avoid blood loss during complex myomectomies, which can sometime be so great as to lead to hysterectomy in young women still wanting children. We believed that preoperative embolization could be a solution, and we carried out a preliminary study in collaboration with the Bichat Hospital's maternity ward. The resulting lack of bleeding brought comfort and safety to both surgeons and patients. In France, this innovative approach was not welcomed. It was while operating in these cases that I became aware of the uselessness of the surgical procedure. This came as a shock: if embolization had already provided a cure, why remove an inactive fibroma?

J. J. Merland and I then decided to assess the efficacy of embolization on its own, and we offered this alternative to surgery to our patients suffering from symptomatic myomas, informing them that it was an experimental technique. My young surgical colleagues were astonished by that choice, and their eyes reflected their great concern as to my mental health. For three reasons, we took this decision without asking an ethics committee for approval. The approval was not mandatory, we had acquired an experience that no one else possessed and—most importantly—we had observed no harmful effects of embolization on the uterus. Finally, we were sure that we would face refusal from these committees that loathe the exploration of unknown territories.

It was then that N. Ciraru-Vigneron remembered that we had treated by embolization seven women with fibroids and severe bleeding who were unfit for surgery. The results were, at the very least, modest: three failed catheterizations, one early revascularization, three improved patients who were lost to followup. When we called back these patients we

observed results that exceeded our expectations: they were cured. By the end of 1994 we had treated 16 patients by embolization. In September 1995, *The Lancet* published our short report on these patients. I am very grateful to the *Lancet* reviewers for being so open-minded. One wrote “I do believe that is an interesting and important paper” whilst the second wrote “I had certainly not heard of fibroids treated by embolization before and feel privileged to have read this account”. They had recognized that our paper was groundbreaking!

A new therapeutic approach to uterine fibromas was born; it was totally unexpected by the gynecologic community. In France, where hormones were much counted on, the particles were ignored. Very few gynecologists took interest in it. They were not prepared for it, and very satisfied with their surgery—they did not hear their patients’ requests: to keep their uterus. Fortunately, our article raised the interest of a few Anglo-Saxon teams, and with us they contributed to developing and improving this treatment. They were pioneers. The first team to get in touch with us was the one of John Reidy and Robert Forman from Guy’s Hospital, who was working on a similar research project and was waiting for the approval of their ethics committee to start the trials. The first to visit us was Bruce McLucas, from UCLA. He introduced the method in the USA and published the first American article on the subject. We became close friends. In the meantime, the teams of Hutchins and Worthington-Kirsh in Philadelphia, and of Sutton and Walker in Guilford, convinced of the potential of embolization, also participated in the development and success of the technique. Soon, other teams—Spies in Washington, and Pron in Canada—contributed to the improvement and generalization of this new therapeutic approach and to its spreading throughout the world.

Today, the efficacy and advantages of fibroma uterine arterial embolization (UAE) are universally recognized. UAE has resulted in over 2000 referenced publications, it is used in the entire world and it has cured a great number of women. We, J. J. Merland and I, our co-workers, D. Herbreteau, N. Ciraru-Vgneron, J. M. Bouret, E. Houdart, and A. Aymard, are aware of the good fortune we were granted. Discovering something both unexpected and meaningful, which brings progress, is something always to be hoped for but rarely happening. This chance was given to us; fortunately we did not let the opportunity escape when it was in our grasp. Today, in this book, John Reidy and the distinguished international authors shows us the importance radiology has taken in the diagnosis and treatment of gynecologic and obstetric conditions, bearing testimony to the irrepressible human urge: the search for progress.

Jacques-Henri Ravina

Preface

One of the curious facts regarding the emergence of uterine artery embolization (UAE) in 1996 as a significant minimally invasive interventional radiological treatment for the common condition of fibroid disease was that the technique was led and championed by Dr. Jacques Ravina, a Parisian gynaecologist and that the radiological expertise was supplied by a team of neuroradiologists.

After early concerns by the gynaecological community, UAE has become widely accepted and practiced and is now regarded in most countries as a significant treatment option for fibroid disease.

Though there have been some technical refinements the embolization technique has remained largely unchanged but what has changed is the clinical evaluation, assessment, and overall management of these cases.

Myomectomy as the surgical uterus-conserving alternative to UAE, perhaps spurred by the uptake of UAE has also undergone developments. This textbook in addition to giving state of the art accounts of many clinical aspects of fibroid embolization has also reviewed current myomectomy techniques and practice. Gynaecologists and interventional radiologists when discussing treatment options with women need to have a working knowledge of the alternative treatment options in order to make the optimal treatment decision. Thus, in this textbook the UAE chapters will give gynaecologists a working knowledge of fibroid embolization whilst similarly the myomectomy chapters will be of value to the interventional radiologist.

Though UAE for fibroids is the most commonly performed vascular intervention in Obstetrics and Gynaecology less common vascular interventions are also covered.

We are very grateful to Dr. Jacques Ravina who in his retirement has written a foreward detailing how he came about to pioneer this procedure and of the early days.

John Reidy

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Part I

**Medical Radiology: Radiological Interventions
in Obstetrics and Gynaecology (Gynaecologist)**

The History and Epidemiology of Fibroids

Christopher J. G. Sutton

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Abstract

Although fibroids are the commonest tumours to afflict the pelvic organs of women and have been recognised and named since ancient times they were not amenable to treatment until the first laparotomy was performed just over 200 years ago. Without the benefit of modern imaging techniques there was considerable confusion between massive fibroids and large ovarian tumours and the diagnosis was often wrong, the mortality rate was extremely high and before the advent of anaesthesia the pain and suffering was appalling. The history of fibroid therapy is reviewed from this horrific start through safer and more conservative surgery to the modern approach using sophisticated imaging techniques and minimal access approaches to therapy. The epidemiology is reviewed with regard to clear racial differences, being much more common among those of African–Caribbean descent and a possible hypothesis is presented to try to explain this. Other factors such as age, parity, oral contraceptive use, the progesterone intra-uterine system and smoking are discussed along with medical diseases such as obesity, diabetes and hypertension and other disorders resulting in the production of unopposed oestrogen.

1 Introduction

Trying to fathom the history of female pelvic diseases is a difficult task and the lack of data is compounded by a certain mystique about female anatomy exemplified by the fact that the ancient Greeks regarded the uterus (hysteros) as the seat of the soul. The Pythagoreans believed that the uterus was bifid which almost implies a knowledge of embryology but probably arose from the fact that they were permitted to dissect animals but human dissection was forbidden. They hypothesised that the left uterine horn represented the west, or darkness from which females were

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derived whereas the right side represented the east, or light in which males developed. They believed that the uterus wandered around the abdominal cavity and that when the organ was displaced the poor woman developed signs of hysteria (O'Dowd and Philipp 1994). Such male orientated thinking persisted until the late nineteenth century allowing gynaecologists to perform ovariectomy—the removal of normal ovaries popularised by the American Surgeon Robert Battey—for a range of dubious indications ranging from hysteria, menstrual madness, insanity and even nymphomania and masturbation (Studd 2006). Such a practice performed at a time when operative mortality was around 70 % represented the zenith of morality in the specialties of surgery and psychiatry and was probably the greatest scandal in medical history (Barker-Benfield 2000).

Even a relatively common condition such as endometriosis only appears as a vague reference in the literature as late as 1690 when a German Physician, Daniel Schroen writing in his *Disputatio Inauguralis Medica de Ulceribus Ulceri* describes it as “a female disorder characteristic of those who are sexually maturing” (Shroen 1690). Almost a century later it is described more graphically by William Smellie from Edinburgh in his textbook *Dissertatio medica inauguralis de utero inflammatione ejusdem*: “An affliction that permeated the whole female system ... producing morbid symptoms that manifestly change the disposition of the entire body” (Smellie 1776). Although it was referred to sporadically in texts from the seventeenth to eighteenth centuries (Knapp 1999) it has never been mentioned in the great encyclopaedias of medical history (Kiple 1993; McGrew 1985; Porter 1997). It is possible that this is due to the extreme rarity of this disease in ancient times when women were subjected to much less retrograde menstruation than their modern counterparts. Thus, in Roman times, girls usually married at 14 or younger and were expected to become pregnant within a few months. Multiple pregnancies and universal breast feeding resulted in a postpartum amenorrhoeic state until they met with an early demise, either in childbirth or naturally, since the average age of death was 35 (Sutton 2006).

2 Fibroids

The situation is completely different with Myomas which are the most common tumours to afflict the pelvic organs in women, and references have been made to them since antiquity. Radiography of some of the remains of Egyptian mummies revealed several instances of calcified myomas which can be seen in the Egyptology Section of the British Museum in London (Sutton 2004).

2.1 Nomenclature

The lesions were certainly recognised at the time of the ancient Greeks, and Hippocrates (460–375 B.C.) who practiced on the island of Kos in the Aegean, called them “womb stones”. Although he did not write specifically on female anatomy he theorised that the uterus went wild if not fed on semen and his followers practiced an elementary form of gynaecology and performed internal examinations. While Galen, a Roman physician who lived in the second century AD described them as “scleromas” (O'Dowd and Philipp 1994).

The term “fibroids” was introduced by Karl Von Rokitansky (1860) who was one of the triad of gynaecologists who described the Rokitansky-Kuster-Hauser syndrome characterised by congenital absence of the vagina and later by Klob (1863). The famous German pathologist Virchow demonstrated their derivation from smooth muscle and introduced the word “myoma” (Haines and Taylor 1975). Both these terms are semantic misnomers if one is referring to the cell of origin and they should more correctly be referred to as leiomyomas because many contain varying amounts of fibrous tissue which is believed to be secondary to degeneration of some of the smooth muscle cells (Droegmueller 1987). Fibroids are the commonest of all pelvic tumours and since this is the most popular name for them it will be often used throughout this text (Jeffcoate 1967).

3 Epidemiology

Although they are usually benign, uterine fibroids are associated with a significant morbidity and are the leading indication for hysterectomy in the United States (Wilcox et al. 1994; Farquhar and Steiner 2002) and most developed countries (Vollenhoven 1998; Progetto Menopausa Italia Study Group 2000). Considering how common they are there is very little data on their epidemiology.

3.1 Age at Menarche

The peak frequency of fibroids is in the 40–50 year age group (Cramer and Patel 1990). An increased risk of developing fibroids has been reported in women who have an early menarche (Marshall et al. 1997; Parazzini et al. 1988). And this may represent increased exposure to endogenous oestrogens since these benign tumours are responsive to both oestrogens and progesterone, (Windham et al. 2002).

3.2 Race

Fibroids are some 3–4 times more common among those of Afro-Caribbean origin in the United States (Marshall et al. 1997) and based on ultrasound evidence the lifetime risk among US black women is estimated to be in the order of 80 % (Day Baird et al. 2003). This black–white disparity in incidence cannot be explained by established risk factors (Kjerulff et al. 1996) and an interesting prospective hypothesis-generating study has been published recently which suggests that it may be due to hair relaxers intended to straighten hair which have been used for many years by millions of US black women (Wise et al. 2012). The Food and Drug Administration (FDA) in the United States has no regularity authority over cosmetic products and listing of ingredients is not mandatory but many contain hormonally active agents such as phthalates which are often listed as “fragrances” or “perfume” (Houlihan et al. 2002). Phthalates from cosmetic products can be absorbed by the skin or inhaled (Romero-Franco et al. 2011) and have been shown to have oestrogenic effects in cell models and experimental animals but the role of phthalates in humans is less clear (Hauser and Calafat 2005). Although the influence of phthalates, diethyl stilboestrol and dioxins is interesting nevertheless at this moment in time it is conjectural and it is possible that greater African ancestry simply increases their genetic predisposition to the development of fibroids (Stewart and Morton 2006).

3.3 Parity

In case-control and cohort studies it has consistently been reported that parous women are at a lower risk of developing fibroids (Parazzini et al. 1996) but it is difficult to know if sterility causes fibroids or vice versa. Certainly pregnancy and breast feeding reduce the time of exposure to unopposed oestrogens which appear to increase the risk of leiomyomata. In the Victorian era it was generally considered that a uterus deprived of pregnancy consoles itself by developing fibroids hence the popular expression at that time that “Fibroids are the reward of virtue, babies the fruit of sin” (Jeffcoate 1967).

3.4 Oral Contraceptives

Several cohort, case–control and population studies on the risk of oral contraceptive (OC) use and the development of fibroids have produced inconsistent results with some showing an increased risk and others a protective effect (Parazzini and Chiaffarino 2006). A cohort study on 162 women conducted by the Royal College of General

Practitioners (1974) in the UK showed a significantly lower risk compared with non-users but past users showed no association. A much larger cohort study, the Walnut Creek (1981) study from the United States, reported on 505 women found that the risk of fibroids increased with duration of use whereas a similar study from the Oxford Family Planning Association in the UK showed a significantly decreased risk with duration of use (Ross et al. 1986).

3.5 Intrauterine Devices

The Mirena intra-uterine system which releases a small amount of norgestrol per day has been reported to reduce the risk of uterine fibroids (Baird 2004).

Although this is almost certainly due to the effect of the progesterone other IUDs have been associated with an increased risk of fibroids but this is likely to be due to the increased chance of detection due to investigation of the abnormal uterine bleeding which is a side effect of these devices (Parazzini et al. 1988).

3.6 Smoking

The effect of increased progestin levels due to smoking is also associated with a 40 % reduced risk of fibroids (Baron et al. 1990) this could also be explained by the unopposed oestrogen theory since there is a lower concentration of bioavailable oestrogen among smokers (Parazzini et al. 1996).

3.7 Hypertension, Obesity, Diabetes and Insulin Resistance and Anovulatory Infertility

Similarly higher oestrogen levels in overweight women and those with anovulatory infertility are associated with increased risk and of fibroid development and lower levels among marathon runners with a decreased risk (Marshall et al. 1998). It has been suggested that there is a recognised syndrome involving the combination of hypertension, obesity and uterine fibroids particularly with long standing hypertension (>5 years) and hypertension diagnosed in women under 53 years old (Summers et al. 1971). There is often co-existing Type 2 diabetes and it has been suggested that the related insulin resistance and hyperlipidaemia can result in fibroid formation in much the same way as they contribute to the formation of atheromatous plaques which is also due to smooth muscle cell proliferation of monoclonal origin (Faerstein et al. 2001).



Fig. 1 Ephraim McDowell (1771–1830): the father of abdominal surgery. Performed the first laparotomy on Christmas Day 1809. Painting by P.W. Davenport in McDowell House. (Photo: Chris Sutton with permission from McDowell House, Danville, Kentucky)



(FIGURE NO. 20)

Jane Todd Crawford (1762-1842)

From a painting of young Jane of unknown origin
McDowell House, Danville, Kentucky.

Fig. 2 Jane Todd Crawford (1763–1842). From a painting of young Jane of unknown origin. Reproduced courtesy of McDowell House, Danville, Kentucky

4 Surgical Treatment of Fibroids

4.1 The First Laparotomy: Christmas Day 1809

Until the beginning of the nineteenth century there was no possible way of removing a large fibroid because it was considered that the surgical opening of the peritoneal cavity resulted in certain death. A little over 200 years ago an event took place which has had a momentous impact on our survival as a species and yet it has been remembered by relatively few. That day saw the birth of operative abdominal surgery which has saved countless lives, yet it

did not take place in one of the great University Teaching Hospitals but in the front parlour of the house of an American country doctor in the small town of Danville in the State of Kentucky.

On the morning of Christmas Day 1809 the brave surgeon Ephraim McDowell (Fig. 1) performed the world's first elective laparotomy to remove a massive tumour from the equally brave patient, Jane Todd-Crawford (Fig. 2). When I say the patient was brave, it was because she had to withstand the horrific pain of a large abdominal incision without the benefit of an anaesthetic and the doctor was brave because the abdominal cavity had never been deliberately opened with a surgical knife before and it was widely accepted that such an intervention would inevitably

result in death. Legend has it that the townsfolk of Danville had gathered in the square outside his house on the morning of the operation and were erecting a gallows so that if Jane Todd-Crawford died at the hands of the “dreadful doctor” he would be hanged in public (Sutton 1993).

4.2 The Surgeon: Ephraim McDowell

McDowell’s family were of mixed Irish and Scottish extraction and he was born in Rockbridge County, Virginia in 1771, the ninth of 12 children (Othersen 2004). When he was 13 years old the family moved to Danville, a frontier town that was the first capital of the State of Kentucky, where his father was appointed Judge of the small community of some “150 homes and some tolerably good buildings” (Ellis 2009). This was before the era of Medical Schools in the United States of America and the young Ephraim decided on a career in medicine early in his life and served as an apprentice to a family physician, Dr Alexander Humphreys in Staunton, Virginia (Gray 1987). When he was 22 he spent 2 years studying anatomy in Edinburgh under Alexander Munro and surgery under the tutelage of John Bell. For financial reasons he had to return home to Danville without earning a medical degree but even without the letters after his name the prestige of being educated at one of the most famous medical schools in the world ensured that he rapidly built up an extensive surgical practice and he came to be regarded as “the best doctor west of Philadelphia” (Tan and Wong 2005). He was renowned for his swift amputations, hernia repairs and lithotomies and would typically operate in the homes of patients with family members gathered round to hold the unfortunate sufferer down. One of his patients was James Polk who, as a 14-year-old boy had several bladder stones removed, and later became the 11th President of the United States (Graham 1981; Bernhard 1980). McDowell’s fame spread locally among the frontier people because this was an area that was expanding rapidly after Dr Thomas Walker had opened up the Wilderness Trail through the Cumberland Gap from Virginia into Kentucky accompanied by frontiersmen and Indian fighters such as Daniel Boone and Davy Crockett (Gray 1987).

4.3 The Patient: Jane Todd-Crawford

Jane Todd-Crawford lived with her family of five children in a small log cabin in Motley’s Glenn near Greensburg, Kentucky, some 60 miles from Danville and at the age of 44 she was thought to be carrying another child and was causing concern with the local doctors and midwives because she was 2 months beyond her due date. The



Fig. 3 Massive ovarian cyst. When removed weighed half of the patient’s weight (Photo: Chris Sutton. St. Luke’s Hospital, Guildford)

attending physicians were in despair and had tried various potions and enemas used to induce labour and in desperation had even employed two midwives to jump up and down on her extremely distended abdomen. All this was to no avail and the poor woman had such a swollen abdomen that she could barely breathe and in desperation they decided to summon the “surgeon from Danville”.

Although the journey from Danville to Greensburg can nowadays be easily accomplished in an hour or so using modern highways, in 1809 it required a lengthy and difficult journey on horseback, crossing many mountain ridges and fording deep rivers and when McDowell set out on this arduous journey the snow had already fallen deeply and there were added hazards from bands of skirmishing Indians, to say nothing of predatory wolf packs and bears. When he arrived he quickly appraised the situation and saw that the swollen abdomen did, indeed, have the appearance of a pregnancy, possibly a multiple one, with a size that was indeed making it difficult for the patient to breathe.

Without recourse to sophisticated imaging techniques it is often difficult clinically to distinguish a massive fibroid from a large ovarian tumour or, indeed, from a term pregnancy (Fig. 3). Possibly because of his education in Edinburgh under the tutelage of the anatomist Alexander Monroe (Secundus), he performed a more thorough examination than had been performed by the local physicians and this included a vaginal examination where he found that the mass was inclined to one side and was mobile and his examining finger felt a normal sized uterus and cervix which were pushed to the other side, all of which indicated that the mass was an “enlarged ovarium”.

Clearly, he was very depressed by his findings and in an account written many years later to a medical student he wrote “I told the lady that I could do her no good and candidly stated to her, her deplorable situation; informed her that John Bell, Hunter, Hay and A Wood, four of the first and most eminent surgeons in England and Scotland, had uniformly declared in their lectures that such was the danger of peritoneal inflammation that opening the abdomen to extract the tumour led to inevitable death.” She was clearly devastated by this pronouncement but told him that it was impossible to continue to live in her present situation since she was almost unable to breathe and felt that she would die anyway. He therefore continued “but, notwithstanding this, if she thought herself prepared to die, I would take the lump from her if she would come to Danville.” He ended this account by stating simply “she appeared willing to undergo an experiment.” (Gray 1987). This must surely be the first documented case of informed consent.

4.4 The Operation

Dr. McDowell returned to Danville expecting to hear no more from her because even the journey with the increasing snowfall that winter was long and difficult and dangerous by horseback, but she was a tough frontier woman and a few days later appeared on his doorstep. Unfortunately the arduous journey had caused considerable bruising over the lower abdomen, where she had rested the enormous tumour



Fig. 4 Jane Todd Crawford as an old lady holding a locket with a portrait of Abraham Lincoln, a distant cousin by marriage to one of her older sisters (Photo: Chris Sutton with permission from McDowell House, Danville, Kentucky)

on the pommel of her saddle. He therefore determined to wait for a few days before deciding to perform the operation and, being a deeply religious man, he timed the procedure to occur on the morning of Christmas Day when many of the townsfolk were in church so that they could bring the efforts of their combined prayers onto his endeavour. He was joined by his nephew, Dr James McDowell, who had graduated a few months previously from the first medical school in America in Philadelphia to join the practice as a partner and he did his best to dissuade his uncle from “the experiment”. The kitchen table was dragged into the front room and Jane Todd Crawford was placed on her back on the table and tilted slightly to the right side and then “he removed all her dressing which might in any way impede the operation”. Many years later when he wrote about the procedure he described it as follows:

I made an incision about 3 inches from the rectus abdominus muscle on the left side, continuing the same 9 in length, parallel

with the fibres of the above-named muscle, extending into the cavity of the abdomen ... the tumour then appeared full in view but was so large that we could not take it away entire. We put a strong ligature around the fallopian tube near the uterus and then cut open the tumour, which was the ovarium and fimbrious part of the fallopian tube, very much enlarged. We took out 15 lbs of a dirty gelatinous-looking substance, after which we cut through the fallopian tube and extracted the sac, which weighed 7 lb and one-half... As soon as the external opening was made the intestines rushed out upon the table and so completely was the abdomen filled by the tumour that they could not be replaced during the operation which was terminated in about 25 min. We then turned her upon her left side so as to permit the blood to escape, after which we closed the external opening with the interrupted suture, leaving out at the lower end of the excision the ligature which surrounded the fallopian tube.

During the whole of this ghastly painful procedure Jane Todd-Crawford remained motionless and merely recited the Psalms in order to calm herself during her ordeal.

She stayed in McDowell's house and the bed in which she lay can still be seen because the entire house and gardens have been turned into a museum to commemorate this amazing feat of pioneering surgery. Ephraim McDowell visited her on a daily basis but on the 5th day he found her making her own bed and reprimanded her severely. She continued to make an excellent recovery and 25 days later she returned home in good health by the same route that she had come, which is now a long distance path named "The Jane Todd Crawford Trail".

The two of them never met again during their lives. Ephraim McDowell died at the age of 59 years of "an acute attack of inflammation of the stomach" which was probably appendicitis and long before the time when a laparotomy could be performed to remove the infected organ. Jane Todd Crawford outlived him and died at the age of 78 years and a picture of her in her old age (Fig. 4) shows her displaying a locket with the picture of Abraham Lincoln, who was born in a log cabin at Sinking Spring Farm very close to where she grew up in Greensburg County and to whom she was related as a cousin when he married one of her sisters.

Unlike his modern counterparts, Ephraim McDowell did not immediately rush off to get this operation published and waited until he had performed two more successful ovariectomies in 1813 and 1816 before reporting it in a journal with a limited readership, "The Eclectic Repertory and Analytical Review of Philadelphia". Two years later he published two further cases in the same journal, one of whom survived, but the other died of peritonitis on the third post-operative day. During his lifetime he performed three further ovariectomies between 1822 and 1826. One involved merely drainage but the patient lived for a long time afterwards, the second underwent complete excision, but



Fig. 5 Charles Clay (1801–1893) who performed the first successful abdominal hysterectomy in Europe on 2 January 1863. Reproduced with permission of the Royal College of Obstetricians and Gynaecologists of London

the third had to be abandoned because of extensive adhesions.

There were a further three that are mentioned in letters and on reading his descriptions it does seem that, although he styled himself an ovariectomist, at least two of his cases were large pedunculated myomas (Ricci 1945; Graham 1950).

News of great surgical advances took a long time to percolate across the Atlantic and even in America McDowell's achievement was greeted with a certain amount of scepticism and even outright disbelief (Gray 1987). It was 14 years later that the first ovariectomy was carried out in Europe by John Lizzars, a fellow student from

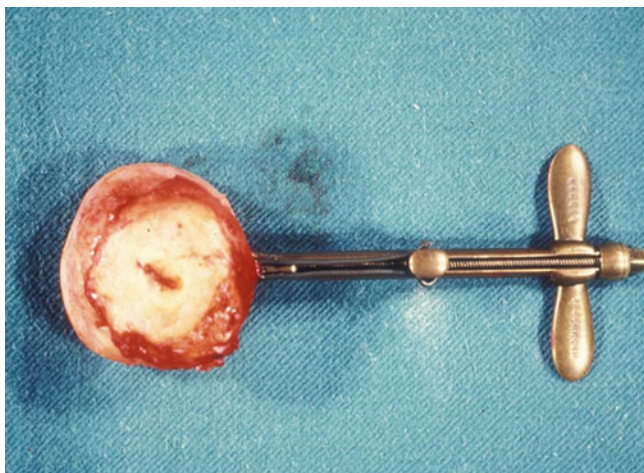


Fig. 6 Massive fibroid exposed at laparotomy (Photo: Chris Sutton from drawing by Medical Illustration Department, St. Luke's Hospital, Guildford). Reproduced with permission

Edinburgh, but the patient died and he then made three more successful attempts in 1825. The initial years of abdominal surgery were associated with an enormous mortality rate, mainly due to uncontrolled haemorrhage or peritonitis and sepsis.

4.5 The First Abdominal Hysterectomy on November 17, 1843

The greatest of the ovariologists in Europe was Charles Clay of Manchester, in the North of England. He studied at the Manchester Royal Infirmary and, like Ephraim McDowell received part of his medical education in Edinburgh. Like McDowell he also started in surgical practice in a small rural community, Ashton-under-Lyne under the shadow of the Pennines in Cheshire. After 16 years he moved to the industrial city of Manchester where he established his surgical reputation. He was a member of the Reform Club and was a friend of my great grandfather, William Sutton, who was a successful businessman in this thriving Victorian metropolis. He is shown in Fig. 5 at the peak of his surgical career, profoundly confident and appearing dapper with his top hat. He was the first to introduce the word 'ovariotomy', a strange choice for the name of this operation in an age when most surgeons were reared in the classics and therefore etymologically correct (Morton 1965).

The first four of his ovariectomies survived but with the fifth he was not so lucky and this turned out to be the first abdominal hysterectomy recorded and it turned out to be a complete disaster. The operation was performed on 17

November 1843 in the first floor room above his Consulting Rooms in Piccadilly, the large square in the centre of Manchester. As was usual in those days he was accompanied by several friends and medical students as spectators and since it was before the time of Pasteur or Lister no one wore masks or surgical gloves and the patient was given brandy and milk to alleviate the pain of the operation since this was a long time before anaesthesia was introduced by WRT Morton in 1846. He was certain that he was dealing with a massive ovarian cyst so he made a long 60 cm surgical incision from the xiphisternum to the pubis. Unfortunately once the peritoneum was entered the patient coughed and the massive tumour was extruded (Fig. 6) and he realised to his horror that it was a huge fibroid and since the patient was now struggling and had to be forcibly restrained by the medical students and it was impossible to replace the hugely enlarged uterus back in the abdominal cavity he had no option but to proceed and performed a subtotal hysterectomy. By an extraordinary coincidence a few days later on the 21st of November, A M Heath who was also an ovarian surgeon in Manchester, found himself in a similar situation operating on a huge fibroid instead of an ovarian cyst. Unfortunately both patients died of a massive haemorrhage a few hours later (Sutton 1997; Benrubi 1988).

The next year, he was more successful with a similar case but on this occasion he placed a ligature of Indian hemp around the supra-vaginal cervix to prevent haemorrhage from the uterine arteries. The patient lived for 15 days, when she fell out of bed in a coma and never regained consciousness. Although this was tragic for the patient it was also sad for Clay since she had survived the critical post-operative period and not succumbed to sepsis, the usual cause of death (Benrubi 1988; Bachman 1990).

From reading contemporary accounts of this woman's post-operative course it is difficult to determine the exact mode of death. She could have had a pulmonary embolus or she could have fallen out of bed in uraemic coma due to occlusion of both ureters by the ligature but popular Mancunian folklore suggests that she was dropped on the floor by a couple of incompetent porters while the nurses changed her bed linen. If this is true then her death was entirely unrelated to the operation and Charles Clay could have claimed to have performed the first successful hysterectomy in the world.

In fact it was not for a further 20 years that he attempted another hysterectomy and this time the patient survived. Interestingly he mentioned this almost as an aside during his important presentation to the Obstetrical Society of London in 1863 when he presented his experience of 395 ovariectomies with only 25 deaths (Clay 1863).

4.6 The First Successful Hysterectomy in the World

The first successful removal of a fibroid uterus was by Walter Burnham in Lowell, Massachusetts in 1853 (Speert 1980). This operation took place in the early days of anaesthesia and the ether caused the patient to vomit so when he made a massive incision from the sternum to the pubis, a large fibroid uterus was extruded through the incision when in fact Burnham was anticipating a massive ovarian cyst. It proved impossible to replace the massive fibroid and he had little choice but to proceed with a subtotal hysterectomy tying off both uterine arteries. The patient recovered and the fact that the original diagnosis was incorrect should not detract from his achievement. He performed a further 15 hysterectomies during the following 13 years but only three survived—the rest succumbing to sepsis, peritonitis, haemorrhage and exhaustion.

Later that year in September, in the same town of Lowell, Gilman Kimball carried out the first deliberate hysterectomy for a fibroid tumour with the patient surviving the operation (Matthieu 1985; Kimball 1855).

It is interesting that these two surgeons came from a small town in rural Massachusetts and considering that hysterectomy is the second most common operation performed on women, second only to caesarean section, that enquiries at the tourist office as to where these operations actually took place lead nowhere and it seems that the burghers of that small town are quite unaware of the fame that should be the just due of these two pioneering surgeons.

4.7 The First Successful Hysterectomy in Europe

Eugene Koeberle from Strasbourg was one of the greatest surgeons in Europe in the latter half of the nineteenth century and the French usually claim that he performed the first successful hysterectomy in Europe. The operation was for fibroids and the diagnosis was correct and in order to obtain haemostasis he used a device of his own invention called a *serre-noeud* which was a wire loop tightened by a screw device that held the cervix like a clamp and allowed it to be exteriorised through the wound (Fig. 7). Eventually the avascular cervical stump necrosed and fell back into the pelvis. This operation took place on 2 April 1863 and was certainly the first in continental Europe but in his lecture to the Obstetrical Society of London Charles Clay had briefly mentioned a successful case of “the entire removal of the uterus and its appendages” which he had performed in Manchester a couple of months earlier on 3 January 1863 (Clay 1863). Anaesthesia was employed regularly and

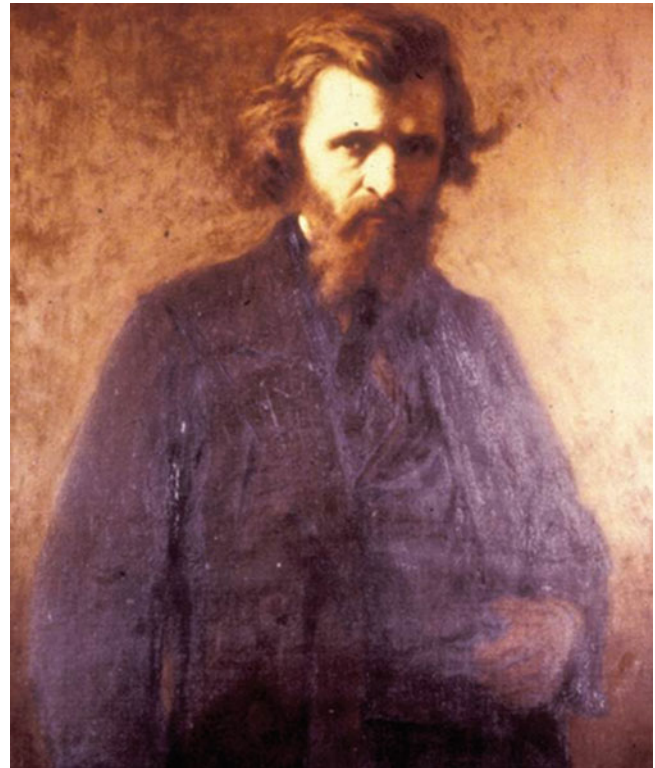


Fig. 7 The *serre-noeud* introduced by Koeberle of Strasbourg, who performed the first successful hysterectomy in continental Europe on 2 April 1863 (Photo: Chris Sutton taken at St. Luke's Hospital, Guildford)

Lister had promulgated the theory of antiseptics and had devised a carbolic spray as an early method of combating it, although there is no actual reference in Clay's writings that he used these methods. In this particular case, which was deliberately undertaken to remove a uterine fibroid, he determined to cut through the cervix and not to open the vagina. The case is well authenticated by three doctors from Preston, Sheffield and Manchester, and immediately after the operation, Professor J Y Simpson, the inventor of chloroform, arrived unexpectedly from Edinburgh. He was greatly interested in the case and took the specimen back to Edinburgh from whence, some time later, he returned a description and a sketch, ending his letter with ‘your case may turn out as a precedent for operative interference in some exceptional cases of large fibroids of the uterus and I congratulate sincerely on the happy recovery of your patient’ (Sutton 2010).

4.8 Surgery in the Late Nineteenth Century

The initial mortality in these operations was extremely high since many of the early abdominal surgeons employed the long ligature hanging out of the lower part of the incision in