

Excision of Endometriosis

Endometriosis by itself is one of the most perplexing and painful disorders ever to be catalogued in the annals of medical history. Yet, making matters worse is the fact that there exist almost as many opinions on how to treat the disorder as there are specialists. Given such a bewildering array of often contradictory information, it's not surprising that medical misconceptions are beginning to slip unnoticed into the fray of competing narratives, where they risk being mistaken as scientific facts or simply differences of opinion. Recently, however, there seems to have been an uptick in misleading claims being circulated on the internet, particularly concerning laser and excision surgery. Patients with endometriosis are already burdened with a devastating disease; yet now it seems they face even more hardship by having to navigate through a minefield of misinformation at a time when they are making some of the most critical medical decisions of their lives.

It was clearly time for an information intervention.

Considering that over 500 new articles on endometriosis are published each year, not to mention the thousands of others still overflowing from the shelves of archives, attempting to summarize such a ponderous range of opinions is an endeavor with odds of success most likely in the range of improbable to impossible. And with so many lingering enigmas still limiting our understanding of endometriosis, then it becomes all the more clear that we have one colossal task before us in trying to find coherence amidst the confusion. All the same, here's our best effort to provide unvarnished explanations to common misconceptions about the various surgical options for treating endometriosis.

Laser? Excision?

One of the most peculiar misconceptions currently prevailing is the idea that excision surgery is able to treat deeply-infiltrating endometriosis better than laser-based modalities. As misinformation goes, this type is especially sophisticated, as it relies on a nearly imperceptible blend of fact and fiction which makes it especially effective in misleading patients into believing that only one type of surgical tool or technique exists which is capable of removing endometriosis in its entirety. However, did you know that some techniques and/or instruments used for excision can cause far more permanent, life-risking, pain-causing, and fertility-compromising damage to organs than others? Did you know that in experienced hands, the CO2 laser can perform excisions much safer, faster, cleaner and with less blood loss than electrocautery or scissors, and that numerous peer-reviewed studies which consistently found that laser surgeries resulted in fewer complications than other methods? Well, if these tiny little factoids were never mentioned on all of those anti-laser websites, then read on for the really true, evidence-based kinds of facts, as opposed to

the almost-true-but-not-quite versions.

Basic Facts

Because CO2 laser surgery is one of the most difficult techniques to learn, it's not uncommon for others to rely on older methods, even though newer technologies have proven to offer many advantages over those from the past. In this situation, Abraham Maslow's famous observation, "If you only have a hammer, you tend to see every problem as a nail," is particularly apropos, for it highlights just how these sorts of hidden biases can affect the quality of surgical options endometriosis patients are offered. If a surgeon is only capable of performing excision with older technologies, what this means for patients is that they are offered medical care based on the limited training of a particular surgeon, rather than on the latest scientific evidence which suggests that other options may be in their best interest. As the old saying goes, choices like this are really not choices at all.

However, before plunging headlong into the debate, let's start with basic definitions of the terms "excision" and "laser", so that we can ensure we're all actually referring to the same concepts.

Excision

The first thing to know about excision is that it simply means to remove something by cutting it out. In the case of surgery, it's tissue or pathological growths that are cut out; excised out. Excisions can be performed in many different ways and with many different instruments. In the 19th century, surgeons even resorted to using their own fingernails to "dig out" (aka, excise) deeply infiltrating endometriosis nodules. Thankfully, we at least now have a few more options than that! In fact, today surgeons have at their disposal not only old-fashioned surgical scissors, scalpels, and electrosurgical instruments, but also a wide range of newer technologies, such as lasers, ultrasonic devices like the Harmonic Scalpel, plasma lasers, such as the Plasma Jet, and robotic technologies like the Da Vinci robot. What remains constant is that, if something is cut away and removed from the body, then that counts as excision, no matter what method facilitated the end result.

And, contrary to popular misconceptions, when performed by an experienced endometriosis surgeon, vaporization, fulguration, ablation, desiccation, and coagulation are all methods that can completely remove endometriosis just as effectively as excision, including the deeply infiltrating type. More evidence and explanations will be provided in more detail below.

Laser

To simplify matters, we'll focus on the carbon dioxide (CO₂) laser, which has become one of the most preferred lasers utilized, not only by gynecologic surgeons, but by the majority of surgeons from other disciplines. Contrary to what some suggest, laser technologies are capable of many things, including the excision of deeply infiltrating endometriosis. In fact, as multiple studies have demonstrated since laser technologies were first introduced into medicine in 1961 (¹), not only can it completely excise lesions lying greater than 5 centimeters beneath the surface, but it can do so with greater precision, less post-operative pain, fewer adhesions, less bleeding, and faster wound healing than essentially any other method currently available.^(2, 3, 4, 5, 6, 7, 8, 9) And, this is the conclusion that surgeons from nearly every single discipline of medicine have made, too.⁽¹⁰⁾ In addition to excisions, the laser can also cut, coagulate, fulgurate, or vaporize, all techniques that achieve the same end result as excision; the complete removal of pathological tissue. Later, we'll provide more detail about these various approaches and why they are sometimes utilized for the treatment of endometriosis.

WHERE'S THE PROOF?!

Of course, it just wouldn't be fair to deliver such big claims without offering any supporting evidence! So, below are the details and statistics derived from national regulatory agencies and some of medicine's most well-respected, peer-reviewed journals and textbooks.

Complete excision can be achieved more gently with laser & other newer technologies

When others proclaim that excision is the only adequate method for removing endometriotic lesions, they are inadvertently asserting what professors of rhetoric would call a spurious argument; that is, an argument fundamentally flawed due to its reliance on an incorrect assumption of causation. In the case of the excision assertion, the premise is that excision, and not any other factor, is the causative agent which causes great surgical results to be achieved. However, just because two variables always seem to show up together - excision and great results - doesn't mean that one factor is actually causing the other to occur.

This may seem preposterous at first. After all, surely such a consistent association could not be a coincidence; surely those proclaiming the benefits of excision would not dare make such assertions without empiric evidence to support such claims? Given all of this, it would be a reasonable conclusion to make that a causative relationship exists; that excision is causing the great surgical results.

Yet, just like the famous childhood game, telephone, we all know that sometimes information can become distorted after being funneled through multiple people and platforms. And so it goes with the excision story. Despite all appearances, it turns out that the excision assertion is flawed to the point of being invalid - spurious, in other words -

because it fails to consider other possible variables that may be influencing outcomes. These other, sometimes unknown factors, referred to by statisticians as confounding variables, may actually be the ones directly causing the observed results.

In the case of the excision argument, there are several confounding variables that contribute more than excision to a successful endometriosis surgery. In the case of successful surgeries, it's not excisional techniques, but rather the **complete removal** of disease that is actually causing the successful outcome. Complete removal of endometriosis is one of the most important variables associated with great results, not excisional techniques. (Another confounding variable which influences surgical outcomes is the skill and experience of the surgeon).

But don't just take our word for it! Randomized controlled studies have shown that thorough eradication of the disease is one of the few variables consistently associated with any measureable reductions in pain and recurrence rates. (¹¹, ¹²) And so, contrary to the pro-excision assertions, all of the credible studies on the subject have found that it makes no difference which technique is utilized; vaporization, ablation, hydrodissection, robotic, Plasma Jet, and scissors excisions have all proven to be effective methods for completely removing endometriosis when performed by an experienced endometriosis surgeon.

There are times when excision is an excellent method to deploy, so we are definitely not saying that excision is bad. However, it's not as error-proof as many suggest. Just as with any surgical technique, incomplete removal of endometriosis can occur with excision, too. What's important to remember is that it's not excision that's driving the bus; it's the surgeon, whose skill and experience ultimately determines outcomes.

Another point to consider is risk versus benefit. In this regard, it's important to point out that, relative to other methods, excision is essentially a more aggressive form of surgery, one in which larger chunks of tissue are removed all at once. This can lead to more bleeding and usually requires more follow-up reparative work to close the large crater hole of raw, bleeding tissue that's left behind. And, as you've probably heard repeated over and over by now, the larger and more aggressive the incision – or excision - the greater chance of excessive bleeding, infections, delayed healing, complications, injuries to adjacent structures, adhesions, and long-term and/or permanent damage of healthy tissue or organs. In fact, the entire premise behind modern-day minimally invasive surgery is to avoid precisely these outcomes.

Outcomes of excision surgery are also influenced by choice of instrument. It's not well known, but the fact is that, when excision surgeries are performed with scissors or monopolar instruments in particular, there are several serious downsides. For example,

excising with monopolar electrical instruments is associated with a higher rate of complications because the tissue-damaging heat energy of these devices is highly unpredictable. As a result, surgeons are not able to control the depth and width of the excisions being made. This means that underlying healthy tissue and organs can be inadvertently destroyed by what is actually electrocution, a complication that can lead to a series of adverse events, including bowel perforations which can turn into life-threatening cases of sepsis. Wound dehiscence is another potential serious complication often associated with aggressive surgery. It can develop when excised areas fail to heal properly, thus increasing pain, potential for serious infection, and prolonging recovery.

There are also circumstances when scissors or monopolar instrument excisions are simply far too risky, especially on endometriosis patients whose tissues and organs may be already exceedingly fragile and compromised. In such situations, surgeons these days prefer to use other instruments, which, contrary to rumor, do completely remove all endometriosis, only in a safer, gentler, and more controlled manner. As an example, most endometriosis experts now agree that using excisional techniques on the ovaries can actually potentially destroy parts of the ovarian reserve, an irreversible and potentially fertility-compromising complication. (¹³, ¹⁴, ¹⁵) For this reason, we've advocated for many years a technique that dispenses with energy sources altogether and instead utilizes gentle hydrodissection methods. (¹⁶, ¹⁷, ¹⁸, ¹⁹, ²⁰) The same goes for treating endometriosis of the Fallopian tubes. Most experts today agree that it's highly inadvisable to excise with monopolar electrical instruments on this very delicate, thin, and therefore easily punctured organ.

In other words, contrary to what you've heard, aggressive surgery is not always better surgery; and gentle removal does not equate to incomplete removal. To suggest that the more aggressive excisional techniques are always better for endometriosis patients, whose internal tissues and organs may already be teetering in a state of chronic fragility, is almost like suggesting we abandon all that we've achieved with modern-day, organ-sparing, minimally invasive medicine, and return to the dark ages of surgery, when large incision surgeries reigned over human lives as the often more serious potential peril than the original illness.

Excisions with monopolar electrosurgical instruments pose greater risks

For over a century now, various forms of electrosurgical technologies have been utilized in medical settings. Despite such a long tradition of use, nevertheless electrosurgery's history is strewn with tales of woe involving exploding uteri, burned-out bowels, and electrified organs, just to name a few of the many unfortunate mishaps to have occurred over the years. Although we've come a long way since such disastrous early experiments with the technology, nevertheless electrosurgical devices – specifically monopolar instruments -

continue to pose grave risks, even when all precautions and protocols are observed. One recent article summed up the potential dangers well, explaining that monopolar devices have an “increased potential for undesired burns and stray currents.”⁽²¹⁾

In terms of monopolar technologies for excisional surgery, studies present especially stark statistics, suggesting that this electrosurgical instrument in particular carries a greater risk of causing injury to internal organs and tissues when compared to lasers and other newer technologies. This is because the electric currents produced by monopolar instruments have a tendency to produce errant sparks of energy (referred to as arcs), which can propel their tissue-burning heat energy throughout the body in extremely unpredictable ways.

Even with the best aim on the planet, there is no surgeon in the world who can force these arcs of electrons to obey human commands. Just as electrostatic energy in the winter can fill our days with surprise shocks and levitating hair, so too can these electrical devices generate waves of charged electrons which move about in erratic patterns. And, as I’m sure you can imagine, wielding unpredictable, tissue-damaging technologies inside the body represents a definite ‘what not to do’ in surgery, especially in the pelvic area where nearly all the body’s most critical major organs, arteries, and blood vessels are headquartered. (As a result of these significant shortcomings, bipolar electrosurgical instruments were eventually introduced which do not pose the same risks as their monopolar cousins).

In contrast, the CO2 laser poses absolutely no danger of having its energy heat arc out in erratic ways. This means that, if the surgeon aims the laser beam at point X, then the laser energy will travel directly to point X, within a predictable degree of accuracy measuring in the microns.

FAQ Typical monopolar setup

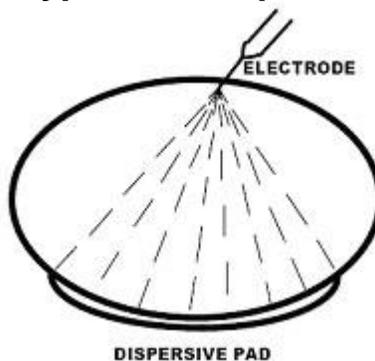


Figure 1: In this figure the dotted lines represent the electrical current that disperses from the tip of the monopolar instrument and then throughout your body, until it reaches one of those large pads you've probably seen attached to defibrillators, for example. However, there is no guarantee that those currents of heat energy will remain in formation; instead, the energy can jump to other nearby tissues or organs, thereby causing organ damage from unintended burns.

Monopolar electro-surgical devices can potentially deliver tissue-damaging heat

As if flying arcs of unruly energy were not enough, the heat energy of monopolar instruments also travels in an unpredictably deeper and wider way than the laser. What this means in a surgical setting is that surgeons have less control over how much tissue will be damaged as they attempt to excise a pathological lesion. For example, the lesion itself may only be 4 millimeters deep, yet the electric heat may travel to a depth of 7 millimeters, as well as several thousand microns wider than the surgeon intended, thereby inadvertently damaging underlying healthy tissue or organs.

Often referred to as collateral thermal damage, studies and textbooks abound with unequivocal warnings concerning the many unfortunate outcomes that can occur as a result of this common complication. Jean Luc Pouly, a well-regarded surgeon specializing in endometriosis, didn't mince words on the subject, stating point blank that "Monopolar electrocoagulation must be avoided because of the risks of accidents and of a complete coagulation of the ovarian vascularization."^(22, 23)

In one of the largest and longest trials to compare laser to electro-surgery, which followed 1000 patients for 10 years, electro-surgical procedures were found to cause serious complications in as many as 20% of the cases, while laser surgeries led to serious complications in only approximately 1% of cases.⁽²⁴⁾ As a result of these findings, the American Urological Association issued what in medicine is the equivalent of a nationwide recall, recommending that surgeons immediately retire traditional electro-surgical instruments in favor of lasers or other safer devices.

Tissue Necrosis

In another recent comparative study, the tissue necrosis caused by monopolar instruments was made especially apparent, as Figure 2 below reveals. Considered a severe and "significant source of post-operative morbidity" this exceedingly painful complication occurs in as many as 20% of mastectomy surgeries when monopolar instruments are used, leading to several excruciating weeks or even months delay in wound healing.^(25,26)

In a rare instance, this study also included the patient's perspective, who described her experience as follows: "I had such a hard time with the left side. The pain was terrible. I was

horrified and very depressed. My left side is still sore. My right side is perfect, no pain at all.” (27)

Through the years other similarly designed studies also linked monopolar electrosurgical devices to higher rates of tissue necrosis and other severe complications.^(28, 29, 30, 31, 32) As a result, few general surgeons can be found today who would willingly return to the days before lasers, when outcomes like these were considered standard fare.



FIGURE 2: A painful and severe case of tissue necrosis, believed to be caused by excessive tissue damage with monopolar instruments, and a complication which is significantly reduced with the use of lasers and other non-electrical technologies. This is what “collateral thermal damage” or unintended tissue damage actually looks like.

Wound dehiscence

Scenario outline



In contrast, the CO₂ laser is renowned for the accuracy of its beam, which can be controlled in terms of its depth and width of penetration within a range as small as 25 microns in diameter or depth (which is about ¼ of the width of a human hair).⁽³³⁾ Contrast this to monopolar energy, which can travel in excess of 7,000 microns (7 millimeters). In experienced hands, this means that the laser can reduce or eliminate entirely unintended tissue or organ damage peripheral to the target pathological lesion. As you may already know, these are not new findings at all. In fact, some early laser pioneers began using the CO₂ laser more than 3 decades ago, not only because they had already been long familiar with the known risks associated with monopolar electrosurgery, but because they realized very quickly that laser was unequivocally providing safer and superior results.^(34, 35, 36, 37)

Often referred to as a bloodless surgery, the laser's ability to reduce and control blood loss has been one of its most cherished features. While not actually bloodless, nevertheless the laser does substantially reduce blood loss, a process achieved because of its unique ability to seal (cauterize) the body's tiny capillaries and small veins at the same time as it cuts. Cutting and sealing at the same time; it's a dream come true as far as surgeons are concerned and only the laser and newer technologies can boast such a dynamic duo of indispensable talents with such an unparalleled record of safety.

Through all of these mechanisms, the laser can excise endometriosis to whatever depth the surgeon deems fit, all with greater precision, less post-operative pain, fewer complications, faster wound healing, and reduced edema (swelling), inflammation, and tissue necrosis than

any other method currently available, with the exception of the latest generation technologies, such as plasma devices. (³⁸, ³⁹, ⁴⁰, ⁴¹, ⁴², ⁴³, ⁴⁴, ⁴⁵, ⁴⁶, ⁴⁷, ⁴⁸)

As a result of the reduced damage and trauma to surrounding tissue and organs, one final highly-coveted outcome can be achieved; a modest, but nevertheless measurable decrease in one of the endometriosis patient's greatest nemeses: adhesions (think "pain" when you hear that word). (⁴⁹) In fact, adhesions are actually one of the main culprits of long-term, chronic post-operative pain. Even in women with endometriosis, adhesions – and not endometriosis - are often the reason for recurring pain after surgery.

These are just a few of the compelling reasons why some of the world's most preeminent surgeons, from such disciplines as general surgery, ophthalmology, oncology, cardiology, urology, gastroenterology, dermatology, and cosmetic surgery have all chosen to go through the trouble of training in laser techniques.

What all of this means in terms of surgical outcomes is that the chance for complications can be significantly reduced when using laser techniques.⁽⁵⁰⁾ What this means for the endometriosis patient is that a greater chance for reducing long-term pain and improving fertility can be achieved.

When laser is the safest and most effective means for removing endometriotic lesions.

We've already briefly touched upon the fact that laser can excise as deeply as any other method. Yet, the issue that many non-laser surgeons fail to bring up is, when is too much excision actually dangerous? Here are the facts. As mentioned earlier, the laser can penetrate to a depth as shallow as 150 microns or as deeply as the surgeon desires. However, it's crucial to understand when it's necessary to limit the depth of penetration rather than increase it. For endometriosis, limiting the depth of penetration is necessary when a lesion is located on, for example, an artery, which, even at its thickest, has a wall width of only 1 centimeter thick. In such cases, excision with scissors or monopolar instruments would actually be dangerous in a life-threatening kind of way.

If those excisional techniques were used, the artery could burst open and become irreparably damaged, an outcome that could leave you dead on the operating table in minutes. Sorry to be so graphic; but that's just one example of the very serious types of potentially perilous outcomes that are being left out of the excision-laser debate. As you can see, it's not a trivial difference of opinion; it's a matter of life and limb. Endometriosis which is located on arteries, blood vessels, and a host of other similarly delicate anatomic structures and organs, like the bowel, bladder, ureters, etc, can be removed with the laser in

a faster, more efficient manner, all with a substantially greater margin of safety and precision than just about any other device available today.

The laser is also the preferred method for treating endometriosis of the ovaries (endometriomas). In fact, for decades now, studies have demonstrated that the laser is better able to remove endometriomas without permanently destroying the reservoir of eggs nestled inside the ovary, a complication linked to heavy-handed use of older techniques, now recognized as a potentially fertility-compromising outcome.^(51, 52, 53)

And finally, one of the least appreciated features of the laser is its ability to reach target tissue otherwise difficult to access in a minimally invasive way. In fact, there are many regions within the body's interior that surgeons find nearly impossible to reach with traditional instruments. Not so with the laser. This is because – well- it's a laser, meaning that it's a beam of light which, as your friendly neighborhood quantum physicist will tell you, can continue traveling apparently into eternity until it hits something. In the case of endometriosis, that something is a lesion, tucked away in parts of the anatomy that cannot be accessed safely through any other means – unless, of course, you'd prefer the nerve-damaging, 8-12 inch incision and OMG pain of laparotomy.

IMPORTANT CAVEATS

Caveats #1: It's not the technique or technology, it's the surgeon

As with all things in medicine, there are some important caveats to be mentioned. The first is that laser excision, like any surgical treatment, is only as safe, accurate and efficacious as the surgeon using it. In short, surgical outcomes ultimately depend entirely on the skill and experience of the surgeon, not the techniques or technologies being utilized.^(54, 55)

Caveat #2: When methods other than laser are best

Although you wouldn't want to use a screw driver to hammer a nail, this doesn't mean that the screw driver is bad; it just means that it's not the right tool for that particular task. The analogy proves useful in the case of analyzing surgical modalities: you wouldn't want to perform laser excision when excision with scissors may be the better option. For example, bipolar electro-surgical instruments (which, again, are not associated with the same risk levels for which monopolar instruments are infamous) can be great instruments for controlling bleeding in areas as large as 2 millimeters in diameter. Meanwhile, too, dense adhesions can also be excised quite nicely with traditional surgical scissors, as many of the leading experts on endometriosis have concluded over the years. ⁽⁵⁶⁾

As for the laser's potential pitfalls, like any surgical instrument it can definitely lead to injury in inexperienced hands or if precautions are not strictly observed. In fact, there have been many cases reported of inexperienced surgeons attempting to use the laser with very unfortunate results. Just as with electrosurgical devices, for example, excessive coagulation of adjacent tissue can occur with the laser if its wielded by a surgeon with limited experience or improper technique. ⁽⁵⁷⁾

Conversely, studies have found that the laser imparts superior results for the treatment of superficial endometriotic implants.⁽⁵⁸⁾

In other words, all surgical techniques and technologies have both advantages and disadvantages and experienced surgeons will understand in which situations each should be applied to achieve the safest and most optimal results.

Caveat #3: The best surgeon in the world cannot stop endometriosis pain from returning

One of the most devastating aspects about endometriosis is that it is often chronic; meaning that all the medical interventions in the world, by all the world's greatest doctors, cannot prevent endometriosis from returning. Unfortunately, due to the highly unpredictable and inexplicable nature of endometriosis, reported recurrence rates are all over the map. However, the average recurrence rate after surgical intervention falls somewhere between about 25% to as high as 55% within 5-7 years after surgery.^(59, 60, 61, 62, 63)

Even with women who have had a total hysterectomy, meaning that their uterus and ovaries were removed, the recurrence rate is not zero as you would expect it to be; rather, approximately 0.5% of patients per year experience recurrence, while as many as 9.1% of those taking hormone replacement therapy will find themselves suffering from recurring symptoms.⁽⁶⁴⁾ Unfortunately, for more severe stages of endometriosis, including the deeply infiltrating type, recurrence rates are even higher.⁽⁶⁵⁾ Worse still, as many as 20% actually do not gain any relief at all from surgical excision procedures, despite the fact that some of the world's leading surgeons performed the procedure. ^(66, 67)

When compared to other options, such as no treatment at all or pharmacological interventions, surgery still offers the best chance for relieving pain and improving fertility, a conclusion supported by multiple studies, as well as the National Institute of Health.⁽⁶⁸⁾ All the same, an ACOG panel of experts reminded us of surgery's many potentially paradoxical outcomes, stating that "there is significant short-term improvement in pain with conservative surgery; however there is also significant recurrence of pain."⁽⁶⁹⁾

This is why endometriosis is still considered an incurable, chronic disorder. So, next time you hear someone saying that your pain returned because your endometriosis returned because your other surgeon left some seeds of the disease behind, because he didn't excise it all, because he performed inadequate surgery; now you'll recognize these claims for what they actually are: misguided misinformation.

FREQUENTLY ASKED QUESTIONS

Okay, so the laser has some clear benefits; But what I really want to know is, can the laser treat deeply infiltrating endometriosis better or as well as other excisional methods?

Okay, you may be saying, so fewer complications and adhesions form from the use of laser. But, isn't the real test of its true mettle whether it can completely remove deeply infiltrating endometriosis; and, if so, does it do so as well or better than other excisional techniques? The answer is a resounding yes and yes.

As usual, to get to the truth, we'll need to start with the basics. As mentioned, one of the most important facts to know about the laser is that it can penetrate as deeply as the surgeon wants it to. It's just that it does so in a more controlled manner, about a hundred and fifty micron layers at a time. And, just like appliances in our kitchen, laser instruments can be set to different strengths, depending on what level of penetration the surgeon deems necessary. In cases of deeply infiltrating endometriosis, the laser can be adjusted to achieve deeper penetration depths.

Another point to bear in mind is that most organs and structures inside the body are not that thick. For example, in normal patients, the average bowel wall measures about 0.5 centimeters in thickness. In some areas, it is only 1.1 millimeters thick.⁽⁷⁰⁾ To give a point of reference, the average adult fingernail is about 1 centimeter wide. (1 millimeter is 1/10th of a centimeter, while 1000 microns is 1 millimeter). Even when the bowel wall has thickened due to disease, such as in the case of bowel endometriosis, its thickness rarely exceeds 1-2 centimeters; still very small measurements. So, when others speak about deeply-infiltrating endometriosis, now you'll know that there is nothing in the body so deep that the laser cannot reach it.

What about laser vaporization? Why would a surgeon only vaporize a lesion instead of excising it?

Here's another especially misleading claim being bandied about; the myth that laser vaporization is an ineffectual method for treating endometriosis. Here are the real facts. Endometriosis comes in all shapes and sizes and depths. To date, in fact, there are over 30

different morphologies that endometriosis is known to take, and deeply-infiltrating endometriosis is only one of many. However, as mentioned already, there are also superficial lesions, those which have not yet infiltrated into deeper layers; and these can be best treated through laser vaporization. These types of superficial lesion have very precise characteristics, ones that can be easily distinguished from other, more deeply infiltrating lesions. While inexperienced surgeons may find it difficult to perceive endometriosis's various morphologies, the same is not true for those with extensive experience in treating the disorder, who will be able to recognize at surgery the various types of lesions and how best to treat them.

Laser coagulation and/or vaporization of certain types of endometriomas (endometriosis on the ovaries) has also proven safer and more effective when compared to other methods. As one study author noted "Ovarian endometriomas of less than 1 centimeter ... can also be removed safely by tissue vaporization," which, as the author goes on to explain, has "little danger of damaging adjacent structures, as one might experience with [electrosurgery]." And, since the ovaries are one of the most common sites in which endometriosis occurs, it makes sense to have available the instrument that has the safest and most effective track record for that particular part of the anatomy.

Okay, but, if you vaporize the lesion, then doesn't that mean there's no chance to biopsy it?

The biopsy red herring is another especially sneaky fallacy, yet one of the more difficult to disprove. Here are the facts. First, when it comes to biopsies, what is considered the standard of care? The American College of Obstetricians and Gynecologists (ACOG) long ago established that attempting to biopsy every single endometriotic lesion would be, not only unnecessary and essentially impossible, but would actually be detrimental to the health and safety of the patient. And what the ACOG says is considered the gold standard in medical care; in fact, ACOG edicts are observed as policy in such renowned medical universities such as Stanford Medical School, Johns Hopkins, Harvard, Yale, and all of the top medical centers throughout the US. Many other disciplines hold similar views concerning excessive biopsying, due to the inherent risks it carries relative to any potential benefits. For example, except in unusual cases, pulmonologists actually refrain from biopsying the lung altogether, due to the risks involved.

We know this seems quite counterintuitive; after all, we've been told for years that the only way to definitely know what some pathological growth is in medicine is to get it sent to a pathologist, who will perform biomedical tests to determine with molecular accuracy the precise nature of the sample. If there were fewer risks associated with the procedure, then biopsying as much as possible would indeed be preferable. However, with endometriosis often presenting with hundreds of lesions, scattered across multiple organs, attempting to

make excisions on each suspicious lesion for the sake of biopsies alone would not only run the risk of prolonging the duration of surgery to a dangerous degree, but it would lead to bleeding wounds in multiple areas throughout the body, which poses even greater risks, can lead to uncontrollable bleeding, and, again, can cause more adhesions and long-term permanent damage to vital organs. This is why ACOG and other regulatory institutes have concluded that the empirical observations of an experienced surgeon will be taken as sufficiently accurate, even though 100% will never be possible. (⁷¹, ⁷²)

Final thoughts on the excision-laser great debate

As you can see, the simplified excision-laser stories presented on many websites are misleading in ways that are actually potentially perilous to patients. One instrument or technique is not better than another; rather, there are simply different techniques and technologies, all of which have their advantages and disadvantages, depending on the unique medical circumstances of each individual and each situation.

What's also clear is that, in order to provide the best care possible, surgeons must have, not only all the instruments currently available, but should undergo all the relevant advanced training in these technologies so that patients can receive the best and most appropriate care possible.

REFERENCES

¹ Leon Goldman

² Sutton CJ, Pooley AS, Ewen SP, Haines P. Follow-up report on a randomised controlled trial of laser laparoscopy in the treatment of pelvic pain associated with minimal to moderate endometriosis. *Fertil Steril* 1997; 68: 1070–4.

³ Sutton CJ, Ewen S, Whitelaw N, Haines P. Prospective randomised, double-blind controlled trial of laser laparoscopy in the treatment of pelvic pain associated with minimal, mild and moderate endometriosis. *Fertil Steril* 1994; 62: 696–700.

⁴ Luciano AA, Maier DB, Nulsen JC, Whitman GF, Koch EI: A comparative study of postoperative adhesion formation following laser surgery by laparoscopy versus laparotomy in the rabbit model. *Obstet Gynecol* 74:220-224, 1989.

⁵ Luciano AA, Whitman GF, Maier DB, Randolph JF, Maenza RM: A comparison of thermal injury, healing patterns and postoperative adhesion formation following CO2 laser and electromicrosurgery. *Fertil Steril* 48:1025-1029, 1987.

-
- ⁶ Brody JE. Laser lessens the trauma of surgery in uterus. *The New York Times*, April 14, 1987.
- ⁷ T, Vilos GA: A comparison between laser surgery and electrosurgery for bilateral hydrosalpinx. *Fertil Steril* 44: 846, 1985.
- ⁸ Semm K (Friederich ER, trans). *Operative Manual for Endoscopic Abdominal Surgery*. Chicago: Year Book Medical Pub., Inc., 1987; 5-15, 61-75.
- ⁹ Nezhat C. *Operative Gynecologic Laparoscopy: principles and techniques*. 1st Edition, 1995.
- ¹⁰ Liboon J, Funkhauser W, Terris D. A Comparison of Mucosal Incisions Made by Scalpel, Co2 laser, Electrocautery, and Constant-Voltage Electrocautery. *Otolaryngol Head Neck Surg* March 1997 vol. 116 no. 3 379-385.
- ¹¹ Healey M, Ang C, Cheng C. Surgical treatment of endometriosis: a prospective randomized double-blinded trial comparing excision and ablation. *Fertil Steril* 2010; 94:2536-40.
- ¹² Wright J, Lotfallah H, Jones K, Lovell D. A randomized trial of excision versus ablation for mild endometriosis. *Fertil Steril*. 2005; 83(6):1830-6.
- ¹³ Nezhat C, Crowgey SR, Garrison CP. Surgical treatment of endometriosis via laser laparoscopy. *Fertil Steril*. 1986; 45:778-83.
- ¹⁴ Chapron C, Vercellini P, Barakat H, Vieira M and Dubuisson JB. Management of ovarian endometriomas. *Hum Reprod Update* 2002;8:6-7.
- ¹⁵ Chapron C, Vercellini P, Barakat H, Vieira M and Dubuisson JB. Management of ovarian endometriomas. *Hum Reprod Update* 2002;8:6-7.
- ¹⁶ Nezhat F, N. C., Nezhat C. A fresh look at ovarian endometriomas. *Contemporary OB/GYN* (1994).
- ¹⁷ Nezhat, C. C., Nezhat, F. F., Nezhat, C. C. & Seidman, D. D. S. Classification of endometriosis. Improving the classification of endometriotic ovarian cysts. *Human reproduction* 9, 2212-2213 (1994).
- ¹⁸ Nezhat, C. C. & Luciano, A. A. Adhesions after resection of ovarian endometriomas. *Fertility and sterility* 59, 934; author reply 935-934; author reply 936 (1993).
- ¹⁹ Nezhat, C. C. & Nezhat, F. F. Reliability of the visual diagnosis of ovarian endometriosis? *Fertility and sterility* 58, 223-224 (1992).
- ²⁰ Nezhat, F., Nezhat, C., Silfen, S. L. & Fehnel, S. H. Laparoscopic ovarian cystectomy during pregnancy. *Journal of Laparoendoscopic surgery* 1, 161-164 (1991).
- ²¹ Presentation by the Association of Professor's of Obstetrics and Gynecology.
- ²² JL Pouly, Julie Drolet, Michel Canis, Sassi Boughazine, Gerard Mage, Maurice-Antoine Bruhat, Arnaud Wattiez. et al. Laparoscopic Treatment of Symptomatic Endometriosis. *Human reproduction* v 11, suppl 3, 1996;67-23

-
- ²⁴ Laser for prostate treatment; randomized, placebo-controlled trial. Annual Meeting of the American Urological Association. May 2010. Study by the McGill University Health Study. Retrieved December 23, 2011 from: http://www.eurekalert.org/pub_releases/2011-05/muhc-epd052011.php.
- ²⁵ Rusby JE, Smith BL, Gui GP: Nipple-sparing mastectomy. *Br J Surg* 2010, 97:305-316.
- ²⁶ Wijayanayagam A, Kumar AS, Foster RD, Esserman LJ: Optimizing the total skin-sparing mastectomy. *Arch Surg* 2008, 143:38-45.
- ²⁷ <http://www.jmedicalcasereports.com/content/5/1/212>
- ²⁸ Kuntz RM, Ahyai S, Lehrich K, Fayad A. Transurethral holmium laser enucleation of the prostate versus transurethral electrocautery resection of the prostate: a randomized prospective trial in 200 patients. *J Urol.* 2004 Sep;172(3):1012-6.
- ²⁹ El-Hakim A. TURP in the new century: an analytical reappraisal in light of lasers. *Can Urol Assoc J.* 2010 Oct;4(5):347-9.
- ³⁰ Gupta NP, Anand A. Comparison of TURP, TUVRP, and HoLEP. *Curr Urol Rep.* 2009 Jul;10(4):276-8.
- ³¹ Gupta N, Sivaramakrishna, Kumar R, Dogra PN, Seth A. Comparison of standard transurethral resection, transurethral vapour resection and holmium laser enucleation of the prostate for managing benign prostatic hyperplasia of >40 g. *BJU Int.* 2006 Jan;97(1):85-9.
- ³² Wilson LC, Gilling PJ, Williams A, Kennett KM, Frampton CM, Westenberg AM, Fraundorfer MR. A randomised trial comparing holmium laser enucleation versus transurethral resection in the treatment of prostates larger than 40 grams: results at 2 years. *Eur Urol.* 2006 Sep;50(3):569-73. Epub 2006 May 2.
- ³³ <http://www.photonics.com/Article.aspx?AID=38560>.
- ³⁴ Videolaseroscopy: A new Modality for the Treatment of Endometriosis and Other Diseases of Reproductive Organs, Camran Nezhat, MD; *Colposcopy & Gynecologic Laser Surgery*, Volume 2, Number 4, 1986.
- ³⁵ Nezhat C, Nezhat FR. Safe laser endoscopic excision or vaporization of peritoneal endometriosis. *Fertil Steril.* 1989 Jul;52(1):149-51.
- ³⁶ Surgical Treatment of Endometriosis Via Laser Laparoscopy, Camran Nezhat, MD, Scott R. Crowgey, MD, Charles P. Garrison, MD; *Fertility & Sterility*, Vol. 45, No. 6, 6/86.
- ³⁷ Safe Laser Endoscopic Excision or Vaporization of Peritoneal Endometriosis, Camran Nezhat, MD, Farr R. Nezhat, MD; *Fertility & Sterility*, Vol. 52, No. 1, 7/89.
- ³⁸ Nezhat C, Nezhat FR. Safe laser endoscopic excision or vaporization of peritoneal endometriosis. *Fertil Steril.* 1989 Jul;52(1):149-51.
- ³⁹ Davis GD. Management of endometriosis and its associated adhesions with the CO2 laser laparoscope. *Obstet Gynecol.* 1986 Sep;68(3):422-5.
- ⁴⁰ Martin, D. C., & Diamond, M. P. (1986). Operative laparoscopy: comparison of lasers with other techniques. *Curr Probl Obstet Gynecol Fertil*, 9, 563-601.

-
- ⁴¹ Keckstein J, Sasse V, Roth A, Karageorgieva E, Tuttlies F. Laser techniques in gynaecology. *Endosc Surg Allied Technol.* 1994 Jun-Aug;2(3-4):176-80.
- ⁴² Davis GD, Brooks RA. Excision of pelvic endometriosis with the carbon dioxide laser laparoscope. *Obstet Gynecol.* 1988 Nov;72(5):816-9.
- ⁴³ Koninckx, P. R. (1996). Complications of CO₂ laser endoscopic excision of deep endometriosis. *Hum Reprod*, 11, 2263-2268.
- ⁴⁴ Meuleman C, Tomassetti C, D'Hoore A, Buyens A, Van Cleynenbreugel B, Fieuws S, Penninckx F, Vergote I, D'Hooghe T. Clinical outcome after CO₂ laser laparoscopic radical excision of endometriosis with colorectal wall invasion combined with laparoscopic segmental bowel resection and reanastomosis. *Hum Reprod.* 2011 Sep;26(9):2336-43. Epub 2011 Jul 19.
- ⁴⁵ Endometriosis Current Management and Future Trends. Juan Gracia-Velasco, Botros RMB Rizk, Botros RMB Rizk, Juan A. Garcia-velasco – 2010.
- ⁴⁶ Roman H, Pura I, Tarta O, Mokdad C, Auber M, Bourdel N, Marpeau L, Sabourin JC. Vaporization of ovarian endometrioma using plasma energy: histologic findings of a pilot study. *Fertil Steril.* 2011 Apr;95(5):1853-6.
- ⁴⁷ Chopin N, Vieira M, Borghese B, Foulot H, Dousset B, Coste J, Mignon A, Fauconnier A, Chapron C. *Ann N Y Acad Sci.* 2003 Nov;997:240-6. Operative management of deeply infiltrating endometriosis: results on pelvic pain symptoms according to a surgical classification.
- ⁴⁸ Shaw RW. Evaluation of the role of laser treatment for the treatment of pain in endometriosis. *Cochrane Database Syst Rev.* 2001;(4).
- ⁴⁹ Kaplan I, Goldman J, Ger R: The treatment of erosions of the uterine cervix by means of the CO₂ laser. *Obstet Gynecol* 41: 795, 1973.
- ⁵⁰ Larson G, Gullberg B, Grundsell H: A comparison of complications of laser and cold knife conization. *Obstet Gynecol* 62: 213, 1983.
- ⁵¹ Nezhat C, Crowgey SR, Garrison CP. Surgical treatment of endometriosis via laser laparoscopy. *Fertil Steril.* 1986; 45:778-83.
- ⁵² Chapron C, Vercellini P, Barakat H, Vieira M and Dubuisson JB. Management of ovarian endometriomas. *Hum Reprod Update* 2002;8:6-7.
- ⁵³ Chapron C, Vercellini P, Barakat H, Vieira M and Dubuisson JB. Management of ovarian endometriomas. *Hum Reprod Update* 2002;8:6-7.
- ⁵⁴ Operative techniques in endometriosis are dependent upon the type and extent of the lesions. (Canis, et al 1989, Cook and Rock, 1991, Koninckx et al 1991, Bruhat et al, 1992).
- ⁵⁵ Operative management of deeply infiltrating endometriosis: Results on pelvic pain symptoms according to a surgical classification. Nicolas Chopin MDa, Marco Vieira MDa, Bruno Borghese MDa, Hervé Foulot

MDa, Bertrand Dousset MD_b, Jöel Coste MD_c, Alexandre Mignon MD_d, Arnaud Fauconnier MD_a, Charles Chapron - Journal of Minimally Invasive Gynecology, Volume 12, Issue 2, April 2005, Pages 106-112.

⁵⁶ Nezhat C, Berger G, Nezhat F, Buttram VC Jr. *Endometriosis; Advanced Management and Surgical Techniques*. New York: Springer-Verlag; 1995; 269.

⁵⁷ Grainger *et al.* (1990) reported certain cases of ureteral injuries that were induced mainly by improper use of lasers.

⁵⁸ Adamson D. Laparoscopic CO₂ laser vaporization of endometriosis, American Fertility Society Annual Meeting, September 1986.

⁵⁹ Sutton C, Hill D. Laser laparoscopy in the treatment of endometriosis. A 5-year study. *Br J Obstet Gynaecol* 1990;97:181-185.

⁶⁰ Abbott JA, Hawe J, Clayton RD and Garry R. The effects and effectiveness of laparoscopic excision of endometriosis: a prospective study with 2-5 year follow-up. *Hum Reprod* 2003;18:1922-1927.

⁶¹ Fedele L, Bianchi S, Zanconato G, Bettoni G and Gotsch F. Long-term follow-up after conservative surgery for rectovaginal endometriosis. *Am J Obstet Gynecol* 2004a;190:1020-1024.

⁶² Abbot JA, et al. The effects and effectiveness of laparoscopic excision of endometriosis: a prospective study with 2-5 year follow-up. *Hum Reprod* 2003;18:1922-7.

⁶³ (Shakiba K, Surgical treatment of endometriosis: a 7-year follow-up on the requirement for further surgery. *Obstet Gynecol* 2008;112:710 and 2008, 111: 1285-92. (published erratum).

⁶⁴ Nezhat C, Berger G, Nezhat F, Buttram VC Jr. *Endometriosis; Advanced Management and Surgical Techniques*. New York: Springer-Verlag; 1995; 266.

⁶⁵ Nezhat C, Berger G, Nezhat F, Buttram VC Jr. *Endometriosis; Advanced Management and Surgical Techniques*. New York: Springer-Verlag; 1995; 298.

⁶⁶ Nezhat C, Berger G, Nezhat F, Buttram VC Jr. *Endometriosis; Advanced Management and Surgical Techniques*. New York: Springer-Verlag; 1995; 293.

⁶⁷ World Endometriosis Research Foundation.

⁶⁸ Sutton CJ, Pooley AS, Ewen SP, Haines P. Follow-up report on a randomized controlled trial of laser laparoscopy in the treatment of pelvic pain associated with minimal to moderate endometriosis. *Fertil Steril* 1997;68:1070-1074.

⁶⁹ ACOG Practice Bulletin #114, July 2011.

⁷⁰ <http://radiology.rsna.org/content/145/2/415.full.pdf>

⁷¹ Walter AJ. Endometriosis: correlation between histologic and visual findings at laparoscopy. *Am J Ob Gyn.* 2001; 184:1407-11.

⁷² Mettler L, et al. Accuracy of laparoscopic diagnosis of endometriosis. *J Soc Laparoendosc Surg.* 2003;7:15-8.