

## Keyhole surgery

How to minimise the mutilation without compromising the cure

→ Anna Wagstaff

Advances in cancer surgery over the past couple of decades have led to significant increases in cure rates in many cancers. Today, patients and surgeons are increasingly focused on how to minimise the operative trauma by using keyhole surgery, sometimes carried out robotically. How can we ensure these new techniques don't put at risk the gains of the past decades?

For most patients with solid tumours, surgery is the most important curative treatment, but it often comes at a price. This may be temporary – pain, time in hospital or time off work – but it may mean long-term disfigurement or losing the ability to function normally. Some procedures – for pancreatic or oesophageal cancer for example – carry a much higher risk of death than most surgery, and patients need to be in the most expert hands.

Today many surgeons are seeking less invasive ways of practising their skills, continuing a trend against former orthodox opinion – that the best chance for the patient was to remove as much as possible during an operation.

It was forty years ago that pioneering voices in breast cancer first took on this established wisdom, arguing that, for the right patients, it was possible to limit

mutilation of the breast without jeopardising the chances of a cure. The battle was bitter, but the minimalist philosophy won through, and breast cancer has led the field in finding ways to limit the damage done by surgery. Surgeons were amongst those who pioneered the use of adjuvant radiotherapy to back up breast conserving surgery, introducing the sentinel node procedure to minimise lymph node removal and developing ways to identify which patients can be spared more aggressive treatment. Today, techniques such as neo-adjuvant chemo and radiotherapy are widely used in a number of cancers to shrink tumours in advance of surgery.

Given this general trajectory, one might have expected that, when minimally invasive approaches (keyhole surgery) started to take off, they would have been welcomed by oncologists as a way

of limiting the damage done by the process of resection. Things got off to a bad start, however, with reports of higher recurrence rates. These were blamed in part on tumour cells seeding in the port-hole incisions as the laparoscopic instruments drew the tumour out. It was also difficult to reach some lymph nodes in certain procedures, leading to fewer nodes than desirable being removed. Moreover, procedures tended to be carried out by surgeons who specialised in minimally invasive techniques, at a time when many in Europe were arguing that cancer operations should only be done by specialists in cancer surgery.

Yet the aim of minimising damage to patients remained attractive, and today a body of evidence is beginning to emerge to indicate that, in expert hands, minimally invasive techniques can be used for many cancers without



compromising the outcome. The strongest evidence is for colorectal cancers, where there have been at least four prospective randomised trials, most of which showed similar survival and recur-

rence rates for both forms of surgery, but less pain, fewer days in hospital and faster recovery for those operated using minimally invasive techniques. Studies have also been done for gastric, prostate,

lung, oesophageal, kidney, bladder and rectal cancers.

Cornelis van de Velde, president of the European Society of Surgical Oncology (ESSO) and head of the Department of Surgical Oncology at Leiden University Medical Centre, in the Netherlands, describes the increased use of minimally invasive procedures as “an unstoppable development”. Better techniques have now overcome negative effects such as the recurrences at the portholes. “Laparoscopic devices are technically more advanced than even a couple of years ago, and all the residents [at Leiden] are now taught with many operations to do it laparoscopically.”

He warns, however, that learning curves can be steep. Many of the comparative data on minimally invasive techniques come from surgeons at top cancer centres who see a large number of patients and have mastered the techniques. Without safeguards, he says, these results are unlikely to be replicated in the wider patient population. “There are number of surgeons carrying out laparoscopic operations who have to switch to open surgery in a high percentage of patients. Those patients – we know from studies – are worse off than the ones who start off with an open procedure.”

Choosing the right indications is essential. Using a minimally invasive approach makes more sense for smaller, easier resections and for operating in areas where open surgery does particular damage. Hein van Poppel, head of the Department of Urology at the Gasthuisberg University Hospital in Leuven, Belgium, cites kidney cancer as an example. “If you have to remove a kidney, you use

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a flank incision with conventional surgery. This hurts a lot because you have to open three muscle layers. As removing a whole kidney is a relatively simple procedure, it makes sense to do so laparoscopically.”

When there is scope for sparing some of the kidney, however, laparoscopic surgery is much trickier.

Partial nephrectomy is becoming increasingly common, largely because earlier tumours are being picked up by chance in ultrasound or CT scans carried out for unrelated reasons. At Leuven, easier procedures are carried out laparoscopically by experts with extensive experience in minimally invasive surgery. But van Poppel says there are a limited number of centres in Europe capable of performing these procedures, and he worries that patients may be being treated in hospitals without the necessary expertise.

“If you do open partial nephrectomy, it is easy for the surgeon, it is safe, you can control the bleeding, and you hardly ever have problems. When you do a laparoscopic partial nephrectomy, and you are not a real expert, sometimes you have to convert to a radical nephrectomy, because you run into problems of bleeding or because the clamping of the kidney takes too long, and you damage the kidney.” A substantial number of patients may be left with chronic kidney disease.

When it comes to more extensive surgery, however, the benefits of minimally invasive approaches are less clear, even in expert hands. Toni Lerut, head of the Department of Thoracic Surgery at Leuven, is one of a select band of surgeons who has carried out more than

2000 oesophagectomies in cancer patients. He has been part of a concerted effort to improve quality that has seen mortality rates in oesophageal cancer operations drop over the past ten years from around 10% to 2%–3% in many European centres, and he does not want to see those gains threatened. “All new technologies have to have their chance,” he argues, “but you need a very critical approach. It took surgeons three decades to establish a number of quality criteria, and minimally invasive cancer surgery should not jeopardise the gains we obtained from open surgery and pathologic examination.”

One of the problems in oesophageal cancer is their ‘chaotic’ lymph drainage, which can go into the chest and cervical region, or down into the upper abdominal compartment and into the gastric vessels and the splenic and hepatic arteries. Lerut says that it is now accepted that at least 20 lymph nodes should be removed to reduce the risk of the cancer spreading. In this case, the extent of the incision will often be determined by the size of the resected specimen and the number of lymph nodes that need to be removed. There is a danger, he says, that people may expect too much from minimally invasive approaches. “They forget that inside you have to do exactly the same things as you did with open surgery.”

“Technically you can do the same surgery as in open surgery. But it is more time consuming, and it needs more concentration from the surgeon and their support.” Published series show a low average of around 15 lymph nodes removed using minimally invasive techniques “That raises some questions

about the oncologic quality of surgery that are still unanswered,” he says.

So far, there is not even strong evidence that patients gain very much, with conflicting results reported on pain, complications, referral to intensive care, hospital stay and return to work. But then gathering evidence in oesophageal cancer is never easy, because it is not very common and a wide variation of techniques is used, including hybrid approaches that combine video-assisted thoracoscopic surgery with open laparotomies, or laparoscopic surgery with open thoracotomies.

“We have looked at this in our own experience. There was a trend, not significant, in terms of benefit for pain in general and fatigue. And I must say, when I see the patients coming back at the first outpatient clinic, four to six weeks after discharge, the way they are coming in is a bit easier, a bit better, compared with the patients who have had open surgery. But that is a very subjective impression.”

For the moment, the decision at Leuven is to restrict minimally invasive approaches to earlier oesophageal cancers, where there is less chance of more widespread lymph node involvement in the different compartments than in more advanced cases. The department is now conducting a prospective study in this patient population to evaluate postoperative mortality and morbidity.

### ENTER THE ROBOT

The picture of steady technical development and cautious evaluation of minimally invasive approaches to cancer has been disrupted in the past couple of years by the swaggering entrance of the

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DaVinci surgical robot – it cuts, it ligates, it sews, it twists and turns just like a living wrist, and to cap it all it provides a three-dimensional view that is better than anything available through laparoscopic cameras or open surgery. The only thing it can't do – yet – is provide the surgeon with a sense of touch.

This new technology could offer the prospect of extending minimally invasive approaches to new cancer indications, and improving the safety in existing ones. “It's potentially a very exciting development,” says ESSO president van de Velde. But he stresses the word ‘potential’. “This is not scientifically proven to be better, but those hospitals that have robotic equipment usually get a higher referral rate than those that have not.”

The hype surrounding this high-tech surgery worries urologist van Poppel. Radical prostatectomy is the cancer procedure where robotic surgery has made the greatest inroads – accounting for between 60% and 70% of such procedures in the US. But while studies so far have shown no consistent evidence of superior results for robotic surgery over either ‘pure’ laparoscopic or open surgery in this procedure, they do show high levels of unrealistic patient expectations. In Belgium, says van Poppel, this is borne out by dramatic changes in referral patterns in favour of hospitals that offer robotic surgery. There is a danger, he argues, that patients who could be treated by active surveillance



A striking contrast. At Leuven's Gasthuisberg University Hospital, more advanced oesophageal cancers are operated openly (above), while some of the earlier ones are operated using thoracoscopic and/or laparoscopic techniques (right). Studies by the thoracic team have shown a trend towards less pain and fatigue in patients operated with minimally invasive surgery



opt for immediate surgery, in the unfounded belief that robotic surgery significantly reduces the risks of incurring urinary incontinence and erectile dysfunction.

Some US studies, he concedes, have shown impressive results in terms of preserving urinary and erectile function, because robotic surgery can get very, very close to the prostate to do an intrafascial dissection. However, early evidence indicates that these procedures are



leading to higher rates of secondary treatment because some of the cancerous tissue was not removed.

Van Poppel himself has more than 2000 open radical prostatectomies to his name, with a track record of preserving urinary and erectile function that keeps him much in demand, despite robotic surgery also being offered in his department. “We do about 200 to 250 radical prostatectomies a year. About half of our patients go for the robot, and half are operated on by me, because they choose me or they have locally advanced disease, which is still operated in an open way.” Though minimising pain and recuperation period is clearly important for patients, he says, the difference between open and minimally invasive procedures is far less in this operation than, for instance, in radical nephrectomies. “When we do it openly, the epidural stays in place for about 48 hours, so they do not suffer pain needlessly. You see them lying one next to the other and there is not much of a difference. After five days they can go home. Even for hospital stay there is not too much of a difference.”

Given that DaVinci machines are expensive to buy, expensive to maintain, cost more in consumables and – in the case of radical prostatectomies – get through waiting lists at half the speed achievable with open procedures, the lack of evidence relating to outcomes remains an issue. Belgium is now carrying out a health technology assessment asking centres with at least two expert robotic surgeons to register everything they do prospectively and provide follow-up data, including oncological outcomes and quality of life measures.

### THREE SAFEGUARDS

Whether or not robot-assisted surgery turns out to be the future, efforts to extend and improve minimally invasive techniques are set to continue as oncologists seek new ways to tailor treatment to the needs of each patient while minimising adverse effects.

A new generation of laparoscopic and thoracoscopic instruments are coming onto the market that offer much of the dexterity so valued in the robotic instruments. And new generations of surgeons are learning minimally invasive procedures during their training, which is easier than adapting existing knowledge of and experience with the open procedure.

Van de Velde argues for three safeguards that will ensure that minimally invasive techniques can be developed without jeopardising the curative power of surgery.

No surgeon – whether they call themselves an organ specialist, a cancer surgeon or a laparoscopic surgeon – should be doing a minimally invasive cancer procedure until they have been trained and certified to do that specific operation using that technique. Retaining that certification should be conditional on completing a minimum number of those operations every year.

Working within a multidisciplinary team is essential. This ensures that the whole approach to treatment is designed to maximise the chance of a cure while minimising the damage, and it subjects the surgeon to scrutiny. “Where you have to discuss the patient you have operated, and you produce an inadequate specimen with an inadequate number of lymph nodes, the whole team will realise that this is not good. It is different to

when you only see your results on paper.”

The third safeguard is audit. Any discussion about the benefits and safety of minimally invasive cancer surgery as carried out in the real world is pure speculation in the absence of data on survival and recurrence figures, complication rates, pain, hospital stay, time off work and long term quality of life, and how these compare with patients operated with open procedures.

Setting in place an audit to gather this level of detail from every hospital that treats cancer patients might seem a gargantuan organisational feat, but van de Velde believes it offers a huge potential for improving standards and outcomes relatively quickly and cheaply. He cites the nationwide audits carried out in Scandinavian countries to address shortcomings in colorectal cancer surgery. Ten-year results from Norway and Sweden showed national recurrence rates reduced by well over 60% and survival improved by almost 10%. It was calculated that the audit process cost a mere 700 euros per life saved.

ESSO is working with other professional groups to roll out something similar in 10 EU countries through the Eureka! project ([www.canceraudit.eu](http://www.canceraudit.eu)). Amongst many other things, this audit will throw light on how minimally invasive colorectal cancer surgery compares to open surgery when it is done well, flag up where patients are being put at risk, and inform the development of guidelines. Van de Velde sees this as the best way to ensure that patients all over Europe can be offered the benefits of minimally invasive procedures without extra risk. “This is a template for other cancers and other countries,” he says.

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