# Literature review of robot-assisted vs laparoscopic prostatectomy

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## Aim

The purpose of this paper is to examine the evidence for the following statement contained in Foster[[1]](#endnote-1): 'I would wish to highlight to your patient that although there is strong evidence to suggest that laparoscopic prostatic surgery has considerably better outcomes than open surgery, the evidence base to suggest that robot assisted laparoscopic surgery is substantially better than conventional laparoscopic surgery without a robot is much less convincing. The Centre for Reviews and Disseminations in York for example produced only 0.08 (95% CI 0.01 to 0.15) more QALYs than laparoscopic prostatectomy.'

## Search methods and sources

No author or title is given in Foster1 for the source cited there, so it was not possible to identify it definitively. A search on 'robot assisted prostatectomy' at the Centre for Reviews and Disseminations in York provides two hits, only one of which is relevant[[2]](#endnote-2). A search of this same database on 'robotic assisted prostatectomy' gives four additional hits, only one of which is relevant[[3]](#endnote-3). A search on 'robotic prostatectomy' gives three additional hits, none relevant. A search on 'robotprostatectomy' gives no hits.

The Cochrane Library was then searched, using similar keywords, and provided three additional sources[[4]](#endnote-4) [[5]](#endnote-5) [[6]](#endnote-6). A search of Glasgow University library found two additional sources, neither topical[[7]](#endnote-7) [[8]](#endnote-8). A Google search provided three additional sources[[9]](#endnote-9) [[10]](#endnote-10) [[11]](#endnote-11).

An audio recording of Douglas Blane's consultation with Prof Dasgupta[[12]](#endnote-12), which includes a discussion of the scientific evidence for robotic-assisted prostatectomy, is cited below and is available on request.

## Review

In such a rapidly changing field, recent studies are the most relevant and invariably cite earlier research. The largest systematic review and meta-analysis of radical prostatectomy patients to date is Tewari et al10, [400 studies and 286,876 patients], which summarises its findings as follows:

'The LRP[[13]](#footnote-1) group had higher positive surgical margin rates than the RALP group but similar rates to the ORP group. LRP and RALP showed significantly lower blood loss and transfusions, and a shorter length of hospital stay than the ORP group. Total perioperative complication rates were higher for ORP and LRP than for RALP. Total intraoperative complication rates were low for all modalities but lowest for RALP. Rates for readmission, reoperation, nerve, urethral, and rectal injury, deep vein thrombosis, pneumonia, hematoma, lymphocele, anastomotic leak, fistula, and wound infection showed significant differences between groups, generally favoring RALP.'

The authors conclude: 'Robotic assistance appears to provide superior outcomes in this regard compared with open retropubic and conventional laparoscopic approaches for most surgeons.'10

The data used in Tewari et al were obtained from the published literature from 2002 to 2010 inclusive, which includes the early years of robot assisted prostatectomy, when results with the new technology would reflect the surgeons' learning curve[[14]](#endnote-13). Results from the four years to 2014 are not included.

In describing Tewari et al as 'a remarkable systematic review', Trinh et al9, summarises its conclusions as follows: 'They found that the rate of adverse events was lower with RARP than with ORP or LRP', and 'across the board, there are fewer complications following RARP than ORP or LRP.'9

It is possible, say Trinh et al, that the better outcomes from RARP reflect 'an extensive regionalization of prostate cancer surgical care to high-volume providers rather than any inherent benefit from robotic technology'.9

'Indeed, there is substantial evidence to support the idea that practice does make perfect and, therefore, that prostatectomy outcomes are better when performed by high-volume surgeons...; an inexperienced surgeon performing a robot-assisted procedure would be expected to achieve poorer results than an experienced surgeon performing an open procedure.'9

Moran et al2- which might be the source cited in Foster1 - also takes the form of a review and meta-analysis, this time of published studies between 2000 and 2011. In comparison to Tewari et al,it is a much smaller review (51 studies and 23,338 patients compared to 400 studies and 286,876 patients), and includes no UK research. Findings include that when compared with open surgery, 'robot-assisted surgery was associated with a statistically significant decrease in length of hospital stay, statistically significant lower rates of blood loss, complications, transfusions, and positive surgical margins (for pT2 tumours only), and increased sexual and urinary function.'2

Differences between robot-assisted and conventional laparoscopic surgery were reported to be minimal. But for the entire study 'the evidence was limited and should be interpreted cautiously', only 3 of the 51 studies being rated 'high quality' and 14 'good quality'2.

Robertson et al4is a review and meta-analysis, aimed specifically at comparing the relative effectiveness of robot-assisted and standard laparoscopic prostatectomy. It includes data from 19 064 men and 58 studies up to 2010. Findings include that robotic prostatectomy 'had a lower risk of major intra-operative harms', such as organ injury and odds ratio, and a 'lower rate of surgical margins positive for cancer.'4 No difference was found in the proportion of men with urinary incontinence at 12 months and there were insufficient data on sexual dysfunction.

The paper concludes: 'Men undergoing robotic prostatectomy appear to have reduced surgical morbidity and a lower risk of a positive surgical margin, which may reduce rates of cancer recurrence and the need for further treatment, but considerable uncertainty surrounds these results.'4

Salinas et al3is a smaller study with a different methodology to those cited above. Rather than a review and meta-analysis, a search was done for 'randomized clinical trials that directly compared two or more radical prostatectomy approaches.' Only three were found. These reported no difference in perioperative outcomes. But 'robotic-assisted prostatectomy showed more favourable erectile function and urinary continence recovery.' Nonrobotic-assisted laparoscopic prostatectomy is judged to be 'a technique clearly marked for obsolescence.'3

In a recent review paper, Patel and Sivaraman[[15]](#endnote-14) summarise the history of radical prostatectomy and discuss perioperative, oncological and functional outcomes.

The first laparoscopic radical prostatectomy was carried out in 1991, but 'due to the inherent technical demands of the procedure, it was not widely accepted. LRP had a long learning curve and was difficult for laparoscopically naive surgeons to grasp.'14

The first robot-assisted laparoscopic radical prostatectomy was performed in 2001, 'with advantages that included three-dimensional visualization, miniaturized wristed instruments, seven degrees of freedom, magnification, and improved ergonomics. RALP was widely adopted—such that by 2010 almost 80% of all prostatectomies in the US were done with robot assistance.'14

Questions have been raised due to the 'lack of randomized comparative trials involving the various approaches to RP'. But the chances of 'well-structured randomized trials to answer skeptics’ questions seems lower by the year,' and it now seems likely that 'such trials may never happen.' 14

In situations like this, 'in which experimental data are not available, observational data must be utilized.''14

The robot cannot make a poor surgeon good, according to Patel and Sivaraman, 'but it will make a good surgeon better.' More than the approach, the experience of the surgeon plays a significant role in outcomes. ...Moreover, the “feel” that open surgeons get has not resulted in a reduction of PSMs compared with the robotic approach.'

'In terms of perioperative outcomes, there is clear evidence showing shorter hospital stays, less blood loss, lower complication rates, and shorter convalescence with RALP. With regard to functional and oncologic outcomes, there is a definite trend towards better results with RALP.' 14

Finally, an August 2014 review by Trinh11 points to a series of recently published meta-analyses comparing laparoscopic and robotic-assisted prostatectomy, which demonstrate:

'... superiority of the robotic approach with regard to functional endpoints such as erectile/sexual function recovery[[16]](#endnote-15) and urinary continence recovery[[17]](#endnote-16), while demonstrating equivalence[[18]](#endnote-17) or possibly superiority10 for oncologic endpoints. Although randomized studies addressing this topic are scarce, two randomized controlled trials examining erectile and/or urinary function recovery did show some benefits for RARP relative to pure laparoscopic radical prostatectomy.[[19]](#endnote-18) [[20]](#endnote-19) These functional findings are of utmost relevance, given that most patients with prostate cancer will not die from prostate cancer, and long-term adverse outcomes are likely to affect a patient’s long-term quality of life.'

## Consultation with Professor Prokar Dasgupta

When asked about the merits of robotic assisted prostatectomy, Professor Dasgupta replied12: "The best quality evidence would come from a randomised trial. We organised one, called the LopeRA study[[21]](#endnote-20), but only a minority of patients agreed to be randomised. The majority of prostate cancer patients do not agree to be randomised. Based on the information out there, they come to me with the idea in their minds that they want robotic surgery. So LopeRA did not recruit to the numbers we needed to make the judgement. There is I am told a randomised trial in Australia. I do not have the outcomes yet because the patients have not been followed up for long enough.

"If you look at a comparison of pure keyhole surgery versus robotic surgery - that came out of Italy[[22]](#endnote-21) - and it shows advantages of robotic. If you look at systematic reviews - and there are a number of these - they show advantages of robotic over open.

"As a surgeon I believe the machine has technical advantages. I only do prostatectomies robotically now. You do not have the sense of touch, which means you are reliant on the imaging. But that is very good, very informative. I have worked with my radiologist for many years and trust what he tells me. Most surgeons feel that the 3-D, high definition vision more than makes up for the lack of sense of touch.

"I feel strongly that current robotic surgery provides advantages to the patient and to me as a surgeon."

## Conclusion

A large-scale, randomised clinical trial comparison of LRP and RALP has not been done. For the reasons stated in Patel and Sivaraman14 and in Dasgupta12 such a trial probably never will be done.

A small RCT (120 patients)21 concluded that 'RARP provided better functional results in terms of the recovery of continence and potency.'

The weight of all the other evidence examined in this review demonstrates that - in terms of both the traditional trifecta and the pentafecta proposed by Patel and Sivaraman14 - robot assisted radical prostatectomy is superior to open surgery and, in the hands of an experienced surgeon, also to laparoscopic radical prostatectomy.

It would appear therefore that this claim in Foster1 is no longer accurate:

"... the evidence base to suggest that robot assisted laparoscopic surgery is substantially better than conventional laparoscopic surgery without a robot is much less convincing".

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