Nerve-Sparing Prostate Cancer Surgery Preserves Sexual Function

The NeuroSAFE robot-assisted prostate removal technique spares nerves involved in erectile function and urinary continence.

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A robot-assisted surgery technique, dubbed NeuroSAFE, spares nerves and helps avoid erectile dysfunction in men undergoing treatment for prostate cancer, according to study findings presented at the 2025 European Association of Urology Congress and published in The Lancet Oncology.

“Our results show that, by using NeuroSAFE, nearly twice as many men don’t have to face potentially life-changing loss of erectile function after prostate surgery,” said senior study author Greg Shaw, MD, of University College London, in a news release. “It is an involved procedure that requires expertise, but it isn’t expensive, particularly given the benefits it offers for patients, and most importantly doesn’t jeopardize cancer control.”

Prostate cancer is the most common cancer (after skin cancer) and the second leading cause of cancer death among men in the United States. Treatment for medium- to high-risk prostate cancer—meaning it is likely to grow and spread—may include surgery, radiation and hormone therapy. Removing the prostate gland, known as radical prostatectomy, can lead to long-term side effects, including urinary incontinence and erectile dysfunction.

Shaw and colleagues evaluated a precision robot-assisted radical prostatectomy procedure that spares nerves that run through the prostate’s outer layers, which are thought to be responsible for producing erections. The technique, which employs a four-armed robot, enables the surgeon to peel off and retain the gland’s outermost layers that contain the crucial nerves. NeuroSAFE has been available for more than a decade, but it is not widely used outside Germany, where it was invented.

The method includes a test to ensure that all malignant cells are removed. A tissue sample is flash-frozen and examined by a pathologist while the operation is still underway to see whether more cancerous tissue needs to be removed.

“In standard robotic surgery, surgeons determine whether to choose nerve-sparing based on MRI scans, digital rectal examinations and biopsy results before surgery. But whereas those methods

can provide guidance, NeuroSAFE provides certainty. And that opens up the option of nerve-sparing surgery for many more men, without compromising on the chances of controlling the cancer," co–lead study author Ricardo Almeida-Magana, MD, of University College London, explained.

The Phase III NeuroSAFE PROOF trial (NCT03317990) was conducted at five National Health Service hospitals in the United Kingdom. The study enrolled men of all ages with non-metastatic prostate cancer, good baseline erectile function and no previous prostate cancer treatment.

Between January 2019 and December 2022, 381 men were randomly assigned to undergo NeuroSAFE surgery, while 191 underwent standard robot-assisted radical prostatectomy. Data were available for 173 men in the NeuroSAFE group and 171 in the standard surgery group.

After a year of follow-up, 39% of the men in the NeuroSAFE group had no or mild erectile dysfunction compared with 23% in the standard surgery group. What's more, 20% of NeuroSAFE recipients reported good erectile function compared with 14% who underwent standard surgery. Conversely, 38% in the NeuroSAFE group reported severe erectile dysfunction compared with 56% in the standard surgery group.

At 12 months, men in the NeuroSAFE group had a significantly higher average erectile function score using the IIEF-5 questionnaire, which ranges from 5 to 25, than those in the standard surgery group (mean 12.7 versus 9.7). This was also the case using the longer IIEF-6 questionnaire (mean 15.3 versus 11.5).

Urinary incontinence after prostate cancer surgery is often temporary. A similar proportion of men in both groups regained full continence by 12 months, but NeuroSAFE recipients recovered urinary control faster. At three months, men in the NeuroSAFE group had a lower average ICIQ urinary incontinence score, indicating better function, but there was no significant difference by six months.

Men in the NeuroSAFE group were more likely to use adjuvant therapy after surgery compared with those in the standard surgery group, Shaw reported. There was little difference in rates of prostate-specific antigen persistence (3.8% versus 2.7%) or biochemical recurrence (5.5% versus 3.7%).

Both surgical methods were generally safe, and serious adverse events were uncommon in both groups (3%). All adverse events were postoperative complications, and no serious events or deaths were attributed to the surgical procedure itself.

"[T]his trial confirms the efficacy of the NeuroSAFE technique to improve functional outcomes after robot-assisted radical prostatectomy in patients with good preoperative urinary and erectile function," the study authors concluded. "These findings should inform guideline updates and confirm the role of the NeuroSAFE technique as an adjunct to guide nerve-sparing."

Derya Tilki, MD, of the Martini Klinik Prostate Cancer Center in Hamburg, where NeuroSAFE was developed, noted that her clinic uses the technique for most of the 2,500 prostate cancer patients treated each year.

“This trial wasn’t designed to look at longer-term cancer outcomes but based on the data we have from using the technique for over 20 years, NeuroSAFE does not appear to affect these,” she said.

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