Effects of nerve sparing on erectile dysfunction and urinary incontinence in robot-assisted radical prostatectomy

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A B S T R A C T

Introduction: In 2020, there were >1.4 million new prostate cancer cases and >370 000 related deaths reported globally. Robot-assisted radical prostatectomy (RARP) is a surgical method used to eradicate localised prostate cancer. However, erectile dysfunction (ED) and urinary incontinence (UI) are common side-effects. This retrospective cohort study investigated erectile function, urinary continence, and oncological outcomes of nerve sparing (NS) in RARP.

Methods: In total, 431 patients who underwent RARP in our institution between January 2018 and April 2023 were recruited; all had attended postoperative follow-up. Regarding ED outcome, patients with a preoperative International Index of Erectile Function–5 (IIEF-5) score ≤7 were excluded from analysis. Patient demographics, 1-hour pad test results, IIEF-5 questionnaire results, and pathological parameters were analysed.

Results: Patients with bilateral NS had a higher mean postoperative IIEF-5 score after 2 months (7.60 vs 3.19 in non-NS patients, P=0.037; 7.60 vs 2.50 in unilateral NS patients, P=0.020) and 3 months (7.40 vs 2.06 in unilateral NS patients; P=0.027). They also had lower mean urine leakage volume in the 1-hour pad test after 1 month (16.40 g vs 49.44 g in non-NS patients, P<0.001; 16.40 g vs 50.82 g in unilateral NS patients, P=0.010) and 2 months (13.60 g vs 35.45 g in non-NS patients; P=0.009). No significant differences were observed in ED or UI between non-NS and unilateral or bilateral NS at 6 and 12 months. There was no correlation between positive surgical margin and NS.

Conclusion: Bilateral NS had significant short-term effects on early recovery of erectile function and urinary continence, relative to unilateral NS and non-NS groups, without compromising oncological outcomes.

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New knowledge added by this study

- Bilateral nerve sparing (NS) is an effective technique for improving erectile function and urinary continence within the first 3 months after surgery.
- No significant differences in erectile dysfunction and urinary incontinence were observed 12 months after surgery.
- Bilateral NS does not increase the risk of positive surgical margins in selected patients.

Implications for clinical practice or policy

- Bilateral NS is a surgical approach that facilitates the early recovery of erectile function and urinary continence.
- Bilateral NS is a safe option for oncologically suitable patients, without increasing the risk of positive surgical margins.

Introduction

Prostate cancer is one of the most common cancers in men. In 2020, there were 2315 new cases of prostate cancer diagnosed in Hong Kong, with an age-standardised incidence rate of 30.5 per 100 000 population.[1] Globally, >1.4 million new prostate cancer cases and >370 000 related deaths were reported in 2020.[2] Robot-assisted radical prostatectomy (RARP) is one of the most common procedures used to eradicate localised prostate

保留神經對機械臂輔助根治性前列腺切除術中勃起功能障礙與尿失禁的影響

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引言：2020年，全球報告的新發前列腺癌病例超過140萬宗，相關死亡個案超過37萬宗。機械臂輔助根治性攝護腺切除術（RARP）是一種用於根治局部前列腺癌的外科手段，然而勃起功能障礙和尿失禁是常見的副作用。本回顧性隊列研究探討了RARP中保留神經對勃起功能、尿控及腫瘤學結果的影響。

方法：本研究納入2018年1月至2023年4月期間於本機構接受RARP並完成術後隨訪的431名患者。在評估勃起功能障礙結果時，排除了勃起功能國際指數（IIEF-5）術前分數≤7的患者。我們分析了患者的人口統計學特徵、1小時護墊測試結果、IIEF-5問卷結果及病理參數。

結果：雙側保留神經組患者在術後兩個月（7.60分與非保留神經組：3.19分，P=0.037；7.60分與單側保留神經組：2.50分，P=0.020）及3個月（7.40分與單側保留神經組：2.06分；P=0.027）的平均IIEF-5分數較高。雙側保留神經組患者在術後1個月（16.40克與非保留神經組：49.44克，P<0.001；16.40克與單側保留神經組：50.82克，P=0.010）及兩個月（13.60克與非保留神經組：35.45克；P=0.009）的1小時護墊測試尿液滲漏量較少。術後6個月和12個月時，非保留神經組和單側或雙側保留神經組之間在勃起功能障礙和尿失禁上未觀察到顯著差異。此外，陽性手術切緣與保留神經之間無相關性。

結論：與單側及非保留神經組相比，雙側保留神經對術後早期勃起功能及尿控恢復具有顯著的短期效果，且不影響腫瘤學結果。

cancer. However, erectile dysfunction (ED) and urinary incontinence (UI) are common side-effects of RARP.[3]

The RARP is typically performed using robotic surgical platforms, such as the da Vinci Surgical System[4] which facilitates minimally invasive prostatectomy. Keyholes are created through which high-resolution, illuminated cameras and robotic arms are inserted into the peritoneal cavity, which is inflated with carbon dioxide to provide adequate space for surgery. If the tumour is small and likelihood of extracapsular extension (ECE) is low, bilateral or unilateral nerve sparing (NS) may be performed to preserve postoperative erectile[5] and lower urinary tract function,[6,7] while taking oncological outcomes into consideration. The decision to use an NS technique is made by the surgeon, who carefully assesses the patient's disease characteristics, drawing on personal experience and current research evidence.[8] The prostate is then dissected from the bladder and urethra, and a re-anastomosis is performed between the bladder neck and the urethra.

A meta-analysis of NS techniques in radical prostatectomy (including RARP) has shown that the use of NS techniques results in lower risks of ED and UI at 3- and 12-month follow-ups.[9] Nerve sparing cases demonstrate superior erectile function, urinary continence, and oncological outcomes compared with non-NS cases.[9] Further analyses indicated that NS is associated with fewer complications than non-NS.[10,11] They also suggest that the use of NS techniques does not lead to inferior oncological outcomes.[10,11] Therefore, we hypothesised that bilateral NS in RARP improves erectile function and urinary continence after surgery. Our study aimed to investigate the effects of NS RARP on the aforementioned side-effects of ED and UI in Hong Kong and provide suggestions for enhancing patient's quality of life.

Methods

We retrospectively recruited 431 patients who underwent RARP in a university-based teaching hospital (our institution) between January 2018 and April 2023. We retrieved their basic demographics, relevant surgical parameters (NS approach, positive surgical margin [PSM], ECE and Gleason score), postoperative 1-hour pad test results (at 1, 2, 3, 6, and 12 months postoperatively), and pre- and post-operative International Index of Erectile Function–5 (IIEF-5) scores[12] at the same time points from electronic medical records. The IIEF-5 assesses erectile function using a 5-point scale across several domains, including erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall sexual satisfaction.[12] All patients attended follow-up at our institution's urology nurse clinic and received guidance on postoperative management, including pelvic floor strengthening exercises.

The primary outcome of the study was to evaluate the effect of NS in RARP on postoperative ED and UI. Secondary outcomes included correlations between other factors (PSM and ECE) and functional outcomes (ED and UI); correlations between NS and PSM or ECE; and postoperative trends in ED and UI beyond 1 year.

Inclusion criteria comprised all patients who had undergone RARP in our institution with follow-up in our nurse clinic. Treatment via bilateral NS, unilateral NS, or non-NS RARP was performed at the surgeon's discretion and the patient's preferences. Exclusion criteria included incomplete data. For the ED outcome, patients with an IIEF-5 score ≤7 were excluded because this score indicates severe ED,[13] and improvement beyond the preoperative baseline was not expected after NS RARP. Patient selection flowcharts for ED and UI are provided in online supplementary Figures 1 and 2, respectively.

R (R Foundation for Statistical Computing, Vienna, Austria) and RStudio software were used for data analysis.[14] All statistical tests were two-sided and incorporated a 5% significance threshold. Cases with missing data due to loss to follow-up were excluded from analysis. Patients selected for

ED and UI analysis had comparable age profiles (online supplementary Tables 1 and 2, respectively). Categorical variables were analysed using Chi squared tests or Fisher's exact tests, depending on the observed frequencies. Continuous variables were analysed using independent sample *t* tests and Pearson correlations were utilised.

Results

Demographics

Among the 431 eligible patients included in the analysis, the mean age was 67.67 years. Regarding ED, the mean ages (±standard deviation) in the non-NS, unilateral NS, and bilateral NS groups were 65.20±4.95, 64.84±6.51, and 66.64±5.35 years, respectively, with no statistically significant differences observed (online supplementary Table 3). Concerning UI, the mean ages (±standard deviation) in the non-NS, unilateral NS, and bilateral NS groups were 66.82±5.48, 67.90±5.49, and 67.94±5.14 years, respectively, with no statistically significant differences observed (online supplementary Table 4). The mean tumour percentage was 12.85% of the total prostate volume and the mean resected prostate volume was 54.39 g. The distribution of pathological Gleason scores is shown in online supplementary Table 5. The majority of patients had a Gleason score of 7: 41.0% had a score of 3+4 (International Society of Urological Pathology [ISUP] Grade Group 2), and 23.9% had a score of 4+3 (ISUP Grade Group 3). Patients with low to intermediate risk prostate cancer, based on the National Comprehensive Cancer Network risk classification, were more likely to undergo bilateral NS operations (Table 1). Further details of NS approaches are presented in Table 1.

Erectile dysfunction

The mean preoperative IIEF-5 score was 10.22 (n=75; online supplementary Fig 1). For the primary outcome, patients with bilateral NS had a higher mean postoperative IIEF-5 score than those without NS at 2 months (non-NS vs bilateral NS=3.19 vs 7.60, *t*=-2.35; P=0.037). Bilateral NS patients also had a higher mean postoperative IIEF-5 score than unilateral NS patients at 2 months (2.50 vs 7.60, *t*=-2.69; P=0.020) and 3 months (2.06 vs 7.40, *t*=-2.61; P=0.027) [Table 2]. Differences in IIEF-5 scores at 1, 6, and 12 months postoperatively were not significant among any of the groups (Table 2). Concerning the secondary outcome, younger age was associated with a higher postoperative IIEF-5 score among non-NS patients (*m*=-0.42; P=0.024).

With respect to postoperative penile rehabilitation, the use of phosphodiesterase type 5 inhibitors (PDE5i) was reported by 38.3%, 77.8% and 60.0% in non-NS, unilateral NS, and bilateral NS patients, respectively. Among those who did not take

TABLE 1. Descriptive analysis of nerve sparing, tumour grading, and positive surgical margin of the study groups*

Non-NS				
	NCCN risk grading			
PSM	**Low**	**Intermediate**	**High**	**Total**
Clear	20 (80.0%)	70 (53.4%)	7 (41.2%)	97 (56.1%)
Focal	2 (8.0%)	26 (19.8%)	5 (29.4%)	33 (19.1%)
Multiple	3 (12.0%)	35 (26.7%)	5 (29.4%)	43 (24.9%)
Total	25 (14.5%)	131 (75.7%)	17 (9.8%)	173 (100%)
Unilateral NS				
	NCCN risk grading			
PSM	**Low**	**Intermediate**	**High**	**Total**
Clear	12 (70.6%)	24 (64.9%)	4 (80.0%)	40 (67.8%)
Focal	3 (17.6%)	6 (16.2%)	1 (20.0%)	10 (16.9%)
Multiple	2 (11.8%)	7 (18.9%)	0	9 (15.3%)
Total	17 (28.8%)	37 (62.7%)	5 (8.5%)	59 (100%)
Bilateral NS				
	NCCN risk grading			
PSM	**Low**	**Intermediate**	**High**	**Total**
Clear	13 (76.5%)	9 (75.0%)	2 (100%)	24 (77.4%)
Focal	3 (17.6%)	0	0	3 (9.7%)
Multiple	1 (5.9%)	3 (25.0%)	0	4 (12.9%)
Total	17 (54.8%)	12 (38.7%)	2 (6.5%)	31 (100%)

Abbreviations: NCCN = National Comprehensive Cancer Network; NS = nerve sparing; PSM = positive surgical margin

* Data are shown as No. (%), unless otherwise specified

TABLE 2. Comparison of erectile dysfunction between different types of nerve sparing procedures

Unilateral NS (n=47) vs Bilateral NS (n=10)				
Time	**Mean IIEF-5 score in unilateral NS group**	**Mean IIEF-5 score in bilateral NS group**	**95% confidence interval**	**P value**
1 month	2.38	3.50	-4.17 to 1.92	0.431
2 months	2.50	7.60	-9.23 to -0.97	0.020
3 months	2.06	7.40	-9.93 to -0.75	0.027
6 months	3.92	5.33	-5.46 to 2.65	0.478
12 months	4.86	11.75	-18.48 to 4.70	0.192
Non-NS (n=18) vs Bilateral NS (n=10)				
Time	**Mean IIEF-5 score in non-NS group**	**Mean IIEF-5 score in bilateral NS group**	**95% confidence interval**	**P value**
1 month	1.86	3.50	-4.65 to 1.37	0.251
2 months	3.19	7.60	-8.52 to -0.30	0.037
3 months	3.71	7.40	-8.35 to 0.98	0.110
6 months	4.15	5.33	-4.61 to 2.24	0.471
12 months	5.27	11.75	-18.43 to 5.47	0.195

Abbreviations: IIEF-5 = International Index for Erectile Dysfunction–5; NS = nerve sparing

PDE5i, reasons included financial considerations—patients must pay out of pocket for PDE5i in Hong Kong, and a perceived lack of efficacy. Even among those who utilised PDE5i, only 38.9%, 35.7%, and 66.7% of non-NS, unilateral NS, and bilateral NS patients, respectively, reported subjective improvement in erectile function. Objective changes in IIEF-5 scores (difference between preoperative and 12-month postoperative scores) were -10.20, -17.03, and -7.67 in non-NS, unilateral NS, and bilateral NS patients, respectively. Further details can be found in online supplementary Tables 6 to 8.

Urinary incontinence

After initial screening and the exclusion of records with missing follow-up data, 264 patients were included in the analysis of UI following RARP (online supplementary Fig 2).

For the primary outcome, patients with bilateral NS had lower mean urinary leakage volume in the 1-hour pad test relative to patients without NS after 1 month (non-NS vs bilateral NS=49.44 g vs 16.40 g, t=3.92; P<0.001) and 2 months (35.45 g vs 13.60 g, t=2.67; P=0.009). Patients with bilateral NS also had lower mean urinary leakage volume than unilateral NS patients after 1 month (50.82 g vs 16.40 g, t=2.61; P=0.01). Differences in UI at 3, 6, and 12 months were not significant among the groups (Table 3). Further details comparing non-NS and unilateral NS can be found in online supplementary Tables 9 and 10.

TABLE 3. Comparison of urinary incontinence between different types of nerve sparing procedures

Unilateral NS (n=47) vs Bilateral NS (n=10)				
Time	**Mean urinary leakage in unilateral NS group, g**	**Mean urinary leakage in bilateral NS group, g**	**95% confidence interval**	**P value**
1 month	50.82	16.40	8.19-60.66	0.010
2 months	32.93	13.60	-4.74 to 43.40	0.114
3 months	28.01	13.00	-8.19 to 38.23	0.202
6 months	11.56	12.35	-16.00 to 14.41	0.917
12 months	9.66	2.10	-1.92 to 17.04	0.116
Non-NS (n=174) vs Bilateral NS (n=31)				
Time	**Mean urinary leakage in non-NS group, g**	**Mean urinary leakage in bilateral NS group, g**	**95% confidence interval**	**P value**
1 month	49.44	16.40	16.29-49.80	<0.001
2 months	35.45	13.60	5.61-38.10	0.009
3 months	25.97	13.00	-2.58 to 28.52	0.100
6 months	10.57	12.35	-11.19 to 9.23	0.790
12 months	7.10	2.10	-0.01 to 10.02	0.051

Abbreviation: NS = nerve sparing

Oncological outcome

Tumour recurrence is an adverse surgical outcome of RARP that requires further oncological management. We identified patients who underwent adjuvant radiotherapy, salvage radiotherapy, or experienced cancer-related death, then stratified them according to NS group, adjusted for age and total Gleason score. Statistical analysis showed no significant differences in oncological outcomes between non-NS and bilateral NS patients (odds ratio [OR]=0.75, 95% confidence interval [95% CI]=0.39-1.27; P=0.321), as well as unilateral NS and bilateral NS patients (OR=0.78, 95% CI=0.18-2.82; P=0.720). These findings indicated that bilateral NS was neither superior nor inferior in oncological outcomes compared with unilateral and non-NS groups, consistent with literature reports.[15,16]

Other correlations

Older patients had lower postoperative IIEF-5 scores at 6 months (Pearson correlation=-0.18; P=0.013) and 12 months (Pearson correlation=-0.22; P=0.014). However, the correlations were not statistically significant at 1, 2, or 3 months postoperatively. There also was no statistically significant correlation between age and postoperative UI.

Patients who underwent non-NS RARP were more likely to have ≥1 positive surgical margin (Chi squared=4.2673, P=0.039, OR=0.46; 95% CI=0.22-0.91). This result was likely attributable to disease-related factors. A larger proportion of patients in the non-NS group had a higher National Comprehensive Cancer Network risk score, indicating more aggressive tumours. Distributions of patients' NS status, tumour grading, and PSMs are shown in Table 1.

Discussion

Erectile dysfunction

Comparisons of postoperative IIEF-5 scores among NS groups revealed significant differences. Patients with bilateral NS exhibited higher postoperative IIEF-5 scores than those without NS at 2 months, highlighting the positive impact of bilateral NS on early erectile function recovery. Similar trends were observed when comparing bilateral NS with unilateral NS at both 2 and 3 months postoperatively. However, no significant differences in IIEF-5 scores were noted at 6 or 12 months, suggesting a convergence of outcomes beyond the initial recovery phase. A meta-analysis Nguyen et al[17] on NS techniques in radical prostatectomy (including RARP) showed that NS cases had lower risks of ED at 3 and 12 months (risk ratio [RR] at 3 months=0.77; 95% CI=0.70-0.85; RR at 12 months=0.53; 95% CI=0.39-0.71). Some differences between our study (Table 2) and that of Nguyen et al[17] might be attributable to the small

sample size and loss to follow-up in our cohort, which may have introduced selection bias.

Our study also demonstrated that the bilateral NS technique was linked to better erectile function outcomes than unilateral NS, consistent with previous findings. In the study by Berg et al,[18] the proportion of patients who were alive, continent, and potent was significantly greater among those with bilateral NS (67.6%) compared to unilateral NS (31.3%) [P<0.001]. Other studies also showed that bilateral NS was associated with lower risks of ED at 3 months (RR=0.80; 95% CI=0.70-0.90) and 1 year (RR=0.80; 95% CI=0.72-0.88) relative to unilateral NS.[17]

However, our study did not identify statistically significant benefits from unilateral NS in terms of ED and UI compared with non-NS. This may be due to a combination of factors, including variation in surgeons' techniques for unilateral NS, small sample size, and relatively small absolute differences in outcomes between the unilateral and non-NS groups.

Further analysis also found that PDE5i therapy yielded only modest improvements in erectile function among individuals who underwent non-NS or unilateral NS procedures. Changes in IIEF-5 scores from preoperative to 12 months postoperative after PDE5i use were -10.20, -17.03 and -7.67 in non-NS, unilateral NS, and bilateral NS patients, respectively. Although approximately two-thirds of bilateral NS patients experienced improved erectile function, the limited number of patients who received PDE5i warrants caution when interpreting effects in this subgroup.

The relationship between age and erectile function in patients without NS was notable. Younger age was associated with higher postoperative IIEF-5 scores, emphasising the potential influence of age on postoperative erectile function recovery, consistent with international literature.[19] Among older patients, postoperative ED remains an important complication. Thus, age is a key consideration when balancing quality of life and oncological control in planning surgical approaches. Surgeons should thoroughly discuss potential side-effects of ED with older patients who have concerns about sexual function prior to surgery involving NS.

Urinary incontinence

In terms of UI, patients with bilateral NS demonstrated lower urinary leakage volumes in the 1-hour pad test compared with those without NS at 1 and 2 months postoperatively. Similarly, bilateral NS was associated with lower urinary leakage volumes than unilateral NS at 1 month. These findings suggest that NS techniques enhance short-term UI recovery, although the differences tend to diminish over time. The benefit of NS on long-term UI recovery beyond 1 year remains uncertain.[9,17,20] Choi et al[20] reported findings similar to ours, indicating that bilateral NS was associated with a higher continence rate than non-NS at 4 months (P=0.043), although the differences at 12 and 24 months were not significant. Conversely, a meta-analysis by Nguyen et al[17] on NS techniques in radical prostatectomy (including RARP) found that NS was associated with lower risks of UI at both 3 months (RR =0.75, 95% CI=0.65-0.85) and 12 months (RR=0.61, 95% CI=0.44-0.84). These discrepancies may be attributed to differences in study design, sample size, and baseline patient characteristics.

Other studies have also shown that bilateral NS is associated with a lower risk of UI at 1 year (RR=0.70, 95% CI=0.50-0.98) and lower risks of ED at 3 months (RR=0.80, 95% CI=0.70-0.90) and 1 year (RR=0.80, 95% CI=0.72-0.88) compared with unilateral NS.17 In our study, while we observed a lower risk of UI at 1 and 2 months after surgery, this difference was not statistically significant at 3 months.

Clinical implications and future research

Our findings have implications for surgical decision-making and patient counselling. Surgeons should consider the potential benefits of bilateral NS for early postoperative recovery of erectile function and urinary continence.[21] Although our study did not demonstrate statistically significant long-term differences in these outcomes, bilateral NS has been reported to play a key role in early recovery. Contributing to improved quality of life and patient satisfaction.[21] Moreover, age should be considered when evaluating erectile function outcomes in patients undergoing non-NS RARP.

Future research could investigate the long-term trajectories of erectile function and urinary continence, exploring factors that contribute to outcome convergence over time. Additionally, efforts to evaluate the impact of NS techniques on quality of life and patient satisfaction could offer a more comprehensive understanding of the clinical implications of these findings.

We also intend to further examine why patients with unilateral NS did not demonstrate better erectile function outcomes than those in the non-NS group. Notably, there was a significant difference in outcomes between the bilateral NS and non-NS groups, despite the small number of patients with bilateral NS (n=10). Therefore, we plan to conduct a detailed review of surgical records for patients with unilateral NS to determine why erectile function outcomes were not superior to those in the non-NS group.

This study also highlights the need for better public and patient education regarding sexual health. In Hong Kong, sexual function currently remains a

major taboo topic among older individuals. Many are reluctant to discuss ED and are even more reluctant to seek medical treatment. In our study, 121 patients displayed severe preoperative ED, but none had sought medical attention. This problem is compounded by the financial barriers to treatment. In public hospitals, PDE5i is entirely self-financed, and even government employees are unable to reclaim their costs. These factors collectively create a substantial barrier for older men in Hong Kong to recognise ED as a treatable clinical condition that could improve their sexual health.

Strengths and limitations

To our knowledge, this is the first local retrospective cohort study in Hong Kong comparing the efficacy of NS approaches in RARP for reducing ED and UI. These findings provide valuable insights into current local RARP practices and serve as a foundation for future prospective studies.

However, there were several limitations, including the retrospective design, potential selection biases, single-centre setting, and inconsistency in follow-up intervals, as some patients might have attended follow-up appointments earlier or later than scheduled due to personal reasons. These factors could affect the interpretation and generalisability of the results. Furthermore, the IIEF-5 score used in this study was based on patients' subjective self-assessment and may not accurately reflect changes in erectile function, particularly among patients without preoperative sexual activity.[22]

Conclusion

The bilateral NS technique during prostatectomy demonstrated a significant positive impact on the recovery of erectile function and urinary continence within the first 6 months postoperatively, without compromising oncological outcomes. However, the extent of this benefit appears to diminish over time, indicating the need for longer-term assessment. These findings contribute valuable insights into the role of NS in prostate cancer surgery and may inform clinical decision-making in prostate cancer management. To validate and expand upon these observations, further prospective, randomised studies with extended follow-up are warranted.

Author contributions

Concept or design: OWK Tsui, S Chun, BSH Ho.
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Critical revision of the manuscript for important intellectual content: All authors.

All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

As an editor of the journal, BSH Ho was not involved in the peer review process. Other authors have disclosed no conflicts of interest.

Declaration

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Ethics approval

This research was approved by the Institutional Review Board of The University of Hong Kong/Hospital Authority Hong Kong West Cluster, Hong Kong (Ref No.: UW-24-099). The requirement for informed patient consent was waived by the Board due to the retrospective nature of the research.

Supplementary material

The supplementary material was provided by the authors and some information may not have been peer reviewed. Accepted supplementary material will be published as submitted by the authors, without any editing or formatting. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by the Hong Kong Academy of Medicine and the Hong Kong Medical Association. The Hong Kong Academy of Medicine and the Hong Kong Medical Association disclaim all liability and responsibility arising from any reliance placed on the content. To view the file, please visit the journal online (https://doi.org/10.12809/hkmj2411709).

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