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**ORIGINAL ARTICLE**

# Open retropubic prostatectomy versus robot-assisted laparoscopic prostatectomy: A comparison of length of sick leave

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**Abstract**

*Objective*. It remains uncertain whether the increased direct costs of robot-assisted laparoscopic radical prostatectomy (RALP) are outweighed by cost savings due to shorter postoperative hospital care and shorter sick leave. This study compared the length of sick leave after RALP with that after radical retropubic prostatectomy (RRP). *Material and methods.* In a cohort study, information on length of sick leave was retrieved for 274 working men undergoing radical prostatectomy (127 RALP and 147 RRP). Data on confounders such as physical workload, average salary, body mass index and disease characteristics were collected from the medical records. Cox regression models were used to compare the treatment groups. *Results*. The median number of days with sick leave was 11 in the RALP group and 49 in the RRP group. After adjustment for confounders, patients in the RALP group were twice as likely to return to work at any time during follow-up (hazard ratio = 2.13, 95% confidence interval 1.62–2.80). High physical workload, low salary and high tumour grade were more common in the RRP group and associated with longer sick leave. *Conclusions*. Patients in the RALP group had shorter postoperative hospital stay and less need for paid sick leave than patients in the RRP group. These data indicate that RALP shortens the convalescence. Part of this difference may, however, be attributable to different selection of patients and different a priori expectations among patients and their doctors. A prospective randomized study is advocated, although blinding is unfeasible.

**Key Words:** *Radical prostatectomy, return to work, sick leave, sick pay*

## Introduction

A radical prostatectomy should ideally combine a safe radical tumour extirpation with preserved urinary continence and erectile function. The question of whether the robot-assisted laparoscopic technique improves the chances of reaching these goals is under debate. Meanwhile, the cost-effectiveness of the new technique remains an issue. Robot-assisted laparoscopic radical prostatectomy (RALP) is associated with high perioperative costs [1–3]. The equipment is expensive and the operating time is, at least during the learning period, longer than in radical retropubic prostatectomy (RRP). It is hoped that these costs will be outweighed by savings due to shorter postoperative hospital care, reduced number of blood transfusions, less need for postoperative analgesics [1,2,4,5] and shorter sick leave.

There are few comparisons of operative techniques with regard to length of sick leave. It has been reported that conventional laparoscopic radical prostatectomy is associated with a shorter convalescence period than RRP [6,7], but comparative evaluations between RALP and RRP are lacking.

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The authors know of no comparative study of sick leave assessing RALP.

In this cohort study, registry data were used to compare RALP with RRP with respect to length of sick leave before return to work after RRP and RALP. It might be argued that doctors stipulate different lengths of sick leave because of their a priori perception of differences in convalescence between the groups, thus creating a self-fulfilling prophecy with shorter sick leave among those subjected to the less invasive approach. However, it was reasoned that such differences should be evident in the first sick-leave period, but should not remain over time to the same extent. Adjustment for confounders such as disease severity and social factors should also facilitate the interpretation of data.



## Material and methods

### *Setting*

In both Sweden and Denmark, healthcare is almost entirely financed by taxes and private hospital care is rare. Furthermore, the public health insurance fund in each country registers all sick leave beyond the 14th day of absence from work due to disease. Both countries use a unique personal identifier (national registration number) for all healthcare registers and medical records.

RALP was introduced at Karolinska University Hospital (Stockholm, Sweden) in 2003, and at Aarhus University Hospital Skejby (Denmark) in 2005. The current volumes of procedures also differ between the hospitals, with around 400 per year at Karolinska and 75 at Skejby. RRP has been used for many years at both institutions.

### *Study population*

The study population was restricted to men in the workforce who were below the age of 64 at the time of surgery, to enable 1 year of follow-up until 65 years, the age of retirement in both Sweden and Denmark. Patients with incomplete information on the study variables in the hospital records were not eligible. In total, 274 consecutive patients operated with RALP or RRP were identified. Patients at Skejby were operated from January 2005 to December 2006, whereas patients at Karolinska were operated between November 2002 and December 2006. The number of patients was chosen to detect a minimum of 25% difference in length of sick leave between the comparison groups.

The study was approved by the regional ethics committees in Stockholm and Aarhus.

### *Data collection*

Data were collected from the hospital records on extent of disease, body height and weight, duration of hospital stay and information on type of work. Number of days of sick pay during the first 12 postoperative months was ascertained through the health insurance funds (the DREAM register in Denmark and Försäkringskassan in Sweden). The average monthly salary was estimated using the job description in the registers and the standard classification of occupations from the respective national official statistics [8,9]. Information on physical workload was lacking for self-employed patients (nine of 274 patients), and this variable was therefore set to missing for those subjects.

Gleason score was categorized into two groups: 2–6 and 7–10. Owing to the distribution of the body mass index (BMI), there was a lack of slim subjects, and BMI was therefore categorized into $<25$, 25–29 and $\geq 30$ kg/m$^2$. Average monthly salary was grouped in tertiles. Physical workload was grouped into low (up to pull/push), medium (lifting over 10 kg a minimum 1/4 of the time) and high (physically strenuous work and lifting over 10 kg a minimum 1/4 of the time) on the basis of the description of job and information from the national research centre for the working environment [10,11].

### *Data analysis*

The following variables were considered potential determinants of length of sick leave and therefore potential confounders of the association between surgical method and length of sick leave: age, prostate-specific antigen (PSA) level, Gleason score preoperative, tumour stage preoperative, BMI, physical workload and average monthly salary at baseline.

Cox proportional hazards regression was used to estimate the hazard ratio (HR) for returning to work associated with surgical technique, adjusting for potential confounders. The proportional hazards assumption was assessed graphically. Since non-proportional hazards were found for the two operating clinics, analyses were stratified by site. The final model included all variables that were a priori considered to be confounders. The unadjusted risk ratio was also estimated in separate follow-up strata, to evaluate whether the associations between the groups were constant during follow-up. The Cox model assumes that the immediate HR between a RALP and a RRP patient is constant over time. In separate follow-up strata this assumption was no longer applicable and therefore the risk ratio was estimated. The analyses were done using the

statistical software program Stata®, release 10. Statistical significance was set at $p < 0.05$.

## Results

Whereas tumour grade and stage were comparable, the mean PSA differed between the groups, with 11.7 ng/ml in the RRP group and 7.7 ng/ml in the RALP group. There was a greater proportion of obese men in the RRP group (16.3%) than in the RALP group (7.1%). Patients in the RRP group had on average higher physical workload and lower salary than those in the RALP group. The median post-operative hospital stay was 3 days in the RRP group and 1 day in the RALP group. (Table I).

Table I. Descriptive characteristics of the two comparison groups undergoing radical prostatectomy.

| | RRP ($n=147$) | RALP ($n=127$) |
|---|---|---|
| Patients included, *n* (%) | | |
| Skejby | 39 (26.6) | 18 (14.2) |
| Karolinska | 108 (73.4) | 109 (85.8) |
| Age (years), mean (range) | 58 (42–63) | 57.9 (43–64) |
| PSA (ng/ml), mean (range) | 11.7 (0.4–60) | 7.7 (0.8–38) |
| Gleason score preoperative, *n* (%) | | |
| 2–6 | 98 (67.6) | 81 (64.8) |
| 7–10 | 47 (32.4) | 44 (35.2) |
| Clinical T stage, *n* (%) | | |
| T1 | 85 (57.8) | 77 (61.1) |
| T2+T3 | 62 (42.8) | 49 (38.9) |
| BMI (kg/m$^2$), mean (range) | 26.9 (19.8–44.9) | 25.9 (20.1–34.8) |
| BMI, *n* (%) | | |
| <25 kg/m$^2$ | 39 (26.5) | 47 (37.0) |
| 25–29 kg/m$^2$ | 84 (57.2) | 71 (55.9) |
| ≥30 kg/m$^2$ | 24 (16.3) | 9 (7.1) |
| Physical workload,[a] *n* (%) | | |
| Low | 77 (54.2) | 89 (72.4) |
| Medium | 34 (24.0) | 16 (13.0) |
| High | 31 (21.8) | 18 (14.6) |
| Average monthly salary (€), tertiles, *n* (%) | | |
| 2010–2801 | 59 (39.7) | 31 (25.4) |
| 2833–3538 | 43 (30.5) | 43 (35.3) |
| 3535–6820 | 42 (29.8) | 48 (39.3) |
| Hospital stay (nights), median (range) | 3 (1–9) | 1 (1–13) |
| Sick pay (days), median (range) | 49 (0–365) | 11 (0–355) |

RRP=radical retropubic prostatectomy; RALP=robot-assisted laparoscopic prostatectomy; Skejby=Aarhus University Hospital Skejby; Karolinska=Karolinska University Hospital; PSA=prostate-specific antigen; BMI=body mass index.

[a]Physical workload: low=pull/push; medium=lifting over 10 kg a minimum 1/4 of the time; high=physically strenuous work and lifting over 10 kg a minimum 1/4 of the time.

The median number of days on sick leave was 11 in the RALP group and 49 in the RRP group (Table I). Figure 1 presents treatment group-specific Kaplan–Meier plots of the time to before returning to work. Five (1.8%) of the 274 patients in the total study population had a second period of sick leave due to the operation during follow-up. This had only a marginal influence on the results in the presented analysis and the follow-up time from the second period was therefore disregarded in the analysis. The causes of the extra periods were mainly supplementary radiation therapy, urethral stricture and psychological conditions.

Forty-two out of 127 patients (33.1%) operated with RALP compared to 16 out of 147 (10.9%) in the RRP group had zero days with sick pay. Among patients with zero days of sick pay, the largest categories of job types were self-employed (20.7%), executives (12.1%) and engineers (6.9%). If all patients with no days of sick pay were excluded from the analysis, the median number of days with sick pay was 26 days in the RALP group (range 2–365) and 55 days in the RRP group (range 2–365) ($p < 0.001$).

At the end of follow-up, there were four patients in the RRP group, but none in the RALP group, who received sick pay. One patient in the RALP group had sick pay for 355 days.

Both the crude and the adjusted HR estimated that patients in the RALP group were twice as likely to return to work at any time during follow-up [crude HR = 2.11, 95% confidence interval (CI) 1.64–2.70] and adjusted HR = 2.13 (95% CI 1.62–2.80) (Table II). High physical workload was associated with longer sick leave (HR for returning to work 0.57, 95% CI 0.40–0.82) compared with low physical workload. If only patients with low physical workload were included in the Cox regression, no difference in the association of length of sick leave was observed between the two groups (adjusted HR = 2.11, 95% CI 1.49–3.00). Patients with clinical T stage T2–T3 were also less likely to return to work (adjusted HR = 0.67, 95% CI 0.50–0.89) (Table II). Patients with a high monthly salary tended to return to work sooner than those with a low salary ($p$ for trend 0.112). No association was found between BMI and length of sick leave ($p$ for trend 0.689) or between age and length of sick leave ($p$ for trend 0.891).

The unadjusted risk ratios for returning to work were not constant during follow-up (Table III). Patients in the RALP group had a 2.5-fold increased probability of returning to work compared with patients in the RRP group during the first 5 weeks after the operation (risk ratio = 2.56, 95% CI 1.94–3.38) (Table III). At 6 weeks after the operation 92

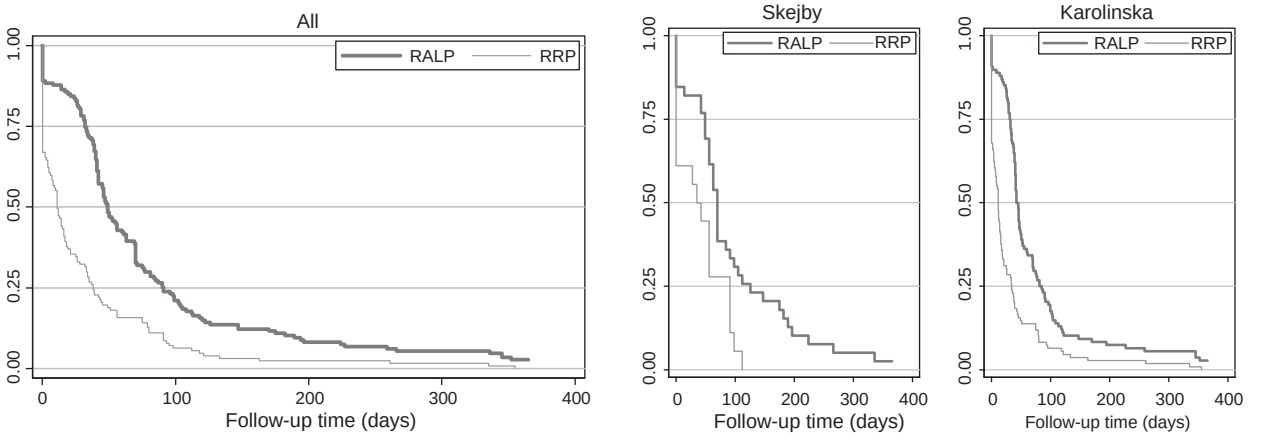


Figure 1. Kaplan–Meier plot estimates time (days) of returning to work after radical prostatectomy for two different groups of patients: for the entire study population (All) and stratified by centre. RALP = robot-assisted laparoscopic radical prostatectomy; RRP = radical retropubic prostatectomy; Skejby = Aarhus University Hospital Skejby; Karolinska = Karolinska University Hospital.

patients (72.4%) in the RALP group had returned to work compared with 41 (27.9%) in the RRP group. The differences were smaller during the following periods (Table III). The risk ratios are not stratified by site or adjusted for potential confounders and therefore are not directly comparable with the results from the Cox models presented in Table II.

## Discussion

This first study comparing the length of sick leave between RALP and RRP found considerably shorter sick-leave periods among patients subjected to RALP. The difference seemed to persist throughout the 1-year follow-up.

Table II. Cox proportional hazards regression, stratified by centre.

| | Crude HR | 95% CI | Adjusted HR | 95% CI | $p^a$ |
|---|---|---|---|---|---|
| Type of operation | 2.11 | 1.64–2.70 | | | |
| RRP | | | 1.00 | Referent | |
| RALP | | | 2.13 | 1.62–2.80 | <0.001 |
| Age | 1.01 | 0.98–1.04 | 1.01 | 0.97–1.04 | 0.891 |
| Gleason score preoperative, *n* (%) | 0.82 | 0.63–1.06 | | | |
| 2–6 | | | 1.00 | Referent | |
| 7–10 | | | 0.81 | 0.60–1.10 | 0.241 |
| Clinical T stage, *n* (%) | 0.68 | 0.53–0.87 | | | |
| T1 | | | 1.00 | Referent | |
| T2+T3 | | | 0.67 | 0.50–0.89 | 0.005 |
| BMI | 0.93 | 0.77–1.13 | | | |
| <25 kg/m$^2$ | | | 1.00 | Referent | |
| 25–29 kg/m$^2$ | | | 1.15 | 0.86–1.55 | |
| ≥30 kg/m$^2$ | | | 1.25 | 0.80–1.94 | 0.689 |
| Physical workload | 0.70 | 0.59–0.82 | | | |
| Low | | | 1.00 | Referent | |
| Medium | | | 0.84 | 0.59–1.19 | |
| High | | | 0.57 | 0.40–0.82 | 0.001 |
| Average monthly salary (€) | 1.32 | 1.13–1.53 | | | |
| 2010–2801 | | | 1.00 | Referent | |
| 2833–3538 | | | 1.27 | 0.90–1.78 | |
| 3635–6820 | | | 1.44 | 1.02–2.03 | 0.112 |

The crude and adjusted hazard ratio (HR) estimates the hazard of returning to work after radical prostatectomy at any time between different exposure groups.
RRP = radical retropubic prostatectomy; CI = confidence interval; RALP = robot-assisted laparoscopic prostatectomy; BMI = body mass index.
[a]Test for trend.
[b]Physical workload: low = pull/push; medium = lifting over 10 kg a minimum 1/4 of the time; high = physically strenuous work and lifting over 10 kg a minimum 1/4 of the time.

Table III. Unadjusted risk ratio of returning to work in separate follow-up strata for patients operated on with robot-assisted laparoscopic prostatectomy compared with patients operated on with radical retropubic prostatectomy.

| | Estimate | 95% CI |
|---|---|---|
| Crude HR | 2.11 | 1.64–2.70 |
| Risk ratio | | |
| 0–5 weeks | 2.56 | 1.94–3.38 |
| 6–12 weeks | 0.97 | 0.70–1.33 |
| 13–24 weeks | 1.34 | 0.92–1.95 |
| >24 weeks | 1.31 | 1.00–1.70[a] |

CI = confidence interval; HR = hazard ratio.
[a]Approximate CI.

This study has several limitations that may have biased the results. First, the allocation of patients to RALP and RRP was not done at random. Some of the RALP patients had actively sought this technique with the firm belief that it is better. Secondly, and more importantly, many doctors have an a priori belief that RALP patients recover more quickly and therefore write shorter sick notes upon discharge for RALP patients than for RRP patients. In this way, shorter sick leave among RALP patients may become a self-fulfilling prophecy. However, the patient can always return to work earlier on his own initiative, if the economic incentive and personal motivation is strong enough.

The social security systems and praxis for sick leave are similar in Denmark and Sweden. In contrast to the Swedish registrars, information on the cause to sick pay is not available at the public health insurance fund in Denmark. This could lead to an overestimation in the length of sick leave caused by the operation among the Danish patients. The authors find it unlikely that the results of this study are altered in any significant way by this fact.

High physical workload and low income were associated with longer sick leave. Moreover, BMI and PSA were higher in the RRP group. This, together with the fact that 30% of the patients in the RALP group did not seek any reimbursement at all owing to sick leave, substantiates the suspicion of a socioeconomic selection of patients to the new technique. Despite all these signs of differences between the comparison groups, there was almost no change in HR upon adjustment for factors related to disease severity or socioeconomic status. Nevertheless, residual confounding by these characteristics cannot be precluded. In addition, the a priori positive expectations on the more modern procedure among patients and doctors are not accounted for in the data.

Whereas no previous study has assessed RALP versus RRP in terms of sick leave, studies have compared convalescence between conventional laparoscopic radical prostatectomy and RRP and found, in agreement with the present data, that patients operated on with the laparoscopic procedure had a shorter period of convalescence than patients operated on with RRP [6,7].

A previous study has shown that patients operated on with RALP who had a BMI of more than 30 kg/m$^2$ had a longer period of convalescence compared with non-obese patients [12]. The present study found only a slight and non-significant association between BMI group and length of sick leave.

Two studies have reported higher costs during hospital stay for RALP compared with RRP [1,2], whereas another study has suggested lower total costs for RALP, although higher direct costs [3]. A valid comparison of the costs for the two techniques cannot be done, because the calculations are based on different models [13]. If one makes the conservative assumption that only half of the sick leave costs in the present data were caused by the choice of technique, this would imply an average difference in sick leave costs of approximately €1363 in favour of RALP [14].

In conclusion, this study found RALP to be associated with shorter sick leave than RRP. The difference could be influenced by expectations of shorter convalescence from doctors as well as patients and a selection bias of patient categories to the two studied methods. However, it seems unlikely that biases explain the entire difference. Allowing RALP to become the state-of-the-art technique would possibly decrease the overall sick-leave costs, but not necessarily, unless such a transition is accompanied by a recommendation for a shorter standard length of sick leave. Unfortunately, the scientific urological community has failed to launch randomized comparative studies between RALP and RRP, to provide an evidence base for the choice of treatment [15] and valid total cost assessments. A trial could never include full blinding, but it would surely provide a better evidence base in the choice between the two techniques.

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