

Aspects of Renal Cell Carcinoma

Association with end-stage renal disease and surgical complications

Akademisk avhandling

Som för avläggande av Medicine Doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet, kommer att offentlig försvaras i Arvid Carlsson, Academicum, Medicinaregatan 3, den 24 maj 2024, klockan 13.00

av **John Åkerlund**

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Fredrik Liedberg, Professor
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Avhandlingen baseras på följande delarbeten

- I. **Åkerlund J**, Holmberg E, Lindblad P, Stendahl M, Ljungberg B, Thorstenson A & Lundstam S. Increased risk for renal cell carcinoma in end stage renal disease – a population-based case-control study. *Scand J Urol*. 2021 Jun;55(3):209-214.
- II. **Åkerlund J**, Sundqvist P, Ljungberg B, Lundstam S, Peecker R, Månsson M, Grenabo Bergdahl A. Predictors for complication in renal cancer surgery: a national register study. *Scand J Urol*. 2023 Aug 21;58:38-45.
- III. **Åkerlund J**, Ljungberg B, Lundstam S, Peecker R, Månsson M, Grenabo Bergdahl A. Associations between hospital volume and renal cancer surgery complications. *Submitted, under revision*.
- IV. **Åkerlund J**, Ljungberg B, Lundstam S, Peecker R, Holmberg E, Månsson M, Grenabo Bergdahl A. End-stage renal disease after renal cancer surgery: risk factors and overall survival. *Submitted, under revision*.

SAHLGRENKA AKADEMIN
INSTITUTIONEN FÖR KLINISKA VETENSKAPER



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Abstract

Surgery is regarded as the mainstay of treatment for renal cell carcinoma (RCC). The aim of this thesis is to examine the outcomes for patients who underwent surgery for RCC, with a specific focus on the contemporary clinical setting. It analyses the relationships between hospital volume, surgical techniques, and patient outcomes. The thesis also investigates end-stage renal disease (ESRD) as a risk factor for RCC, including survival outcomes for patients with ESRD-related RCC. Finally, it assesses the outcomes for patients who developed ESRD following surgery for RCC. This thesis comprises four studies, all of which were based on the National Swedish Kidney Cancer Register, which was linked to several other quality registers to obtain valid and reliable data.

Paper I evaluated the risk of developing RCC for patients that had been previously diagnosed with ESRD. The results showed a 5–10 times higher risk of RCC for patients with ESRD, dependent on time. The overall survival was lower in patients with ESRD and RCC compared to patients with RCC not suffering from ESRD (RCC-only).

Paper II assessed the predictors for major complications and death after surgery for RCC. A twofold increase in number of complications was seen in open surgery compared to minimally invasive techniques. Overall predictors for major complications were comorbidities, larger tumours, kidney function, and surgical technique.

Paper III determined the relationship between hospital volume and major complications and mortality. The percentages of major complications were 10.1% at high-volume hospitals, 7.3% at intermediate-volume hospitals, and 6.6% at low-volume hospitals. When adjusted for confounders, high-volume hospital was an independent predictor for major complications. With respect to mortality alone, especially when complications occur, patients may fare better at high-volume hospitals than lower-volume hospitals.

Paper IV disclosed risk factors for the development of ESRD after RCC surgery and determined their effect on overall survival. Patients with ESRD after renal cancer surgery had lower survival rates compared to patients with RCC-only. Risk factors included older age, comorbidities, advanced tumours, and radical nephrectomy. Choosing nephron-sparing surgery and active surveillance may decrease the risk of severe kidney dysfunction.

Overall, the National Swedish Kidney Cancer Register offer high quality data for research.

Keywords: renal cell carcinoma surgery, end-stage renal disease, quality register, complications, hospital volume, survival

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