Survival of patients undergoing surgery for metastatic spinal tumours and the impact of surgical site infection

Ross A. Atkinson, PhD[1,2] (ross.atkinson@manchester.ac.uk)
John Stephenson,PhD[3], Anna Jones, MSc[1], Benjamin Davies, BSc (Hons) MBChB (Hons), MRCS[1], Dmitri van Popta, MBChB, FRCS (Orth)[1], Brad Williamson, FRCS[1], Karen Ousey, PhD, RGN[3]

[1]Greater Manchester Neurosciences Centre, Salford Royal NHS Foundation Trust
[2]Institute of Inflammation and Repair, University of Manchester
[3]School of Human and Health Sciences, University of Huddersfield

Background

Patients with metastatic spinal tumours have a poor prognosis. Surgery is often palliative and aims to relieve debilitating symptoms of pain, incontinence and paralysis[1]. Achieving successful wound healing after surgery is challenging because patients are often malnourished, catabolic and immunosuppressed. Surgical site infection (SSI) is therefore more common in these patients than those undergoing non-tumour spinal surgery. The onset of SSI can, in severe cases, result in the removal of spinal instrumentation implanted specifically to stabilise the spine, ultimately leading to surgical failure. However, the degree to which SSI impacts on mortality is unknown.

Aim

- **To assess the impact of SSI on patient survival after surgery for spinal metastases.**

Methods

Patients who had previously undergone surgery for treatment of metastatic spinal tumours at Salford Royal NHS Foundation Trust between 1st January 2009 and 31st December 2012 were identified through the hospital electronic patient record. The following data were collected:

- Demographics
- Operative details
- American Society of Anesthesiologists (ASA) grade
- Revised Tokuhashi Score (RTS)
- Patient survival (final follow up as of 15th July 2014)
- Occurrence of infection (according to Public Health England criteria)

A semi-parametric Cox proportional hazards survival analysis was used to assess the relationships between covariates and survival. Assumptions for the analysis were checked in exploratory procedures.

Results

A total of 152 patients (77 females and 75 males) underwent surgery for spinal metastases over the four year study period. Mean age at operation was 60.5 years (SD 12.9 years). Seventeen patients (11.2%) experienced SSI. At the time of last follow up, 117 patients had died. The assumption of proportional hazards was found to be tenable, and measures of patient fitness were not excessively correlated. Survival curves using ASA and RTS scores are shown in Figures 1 and 2.

Overall, median survival time from operation was 262 days (95% CI: 190 - 334 days):

SSI: 135 days (95% CI: 62 – 208 days)

Non-SSI: 276 days (95% CI: 183 – 369 days)

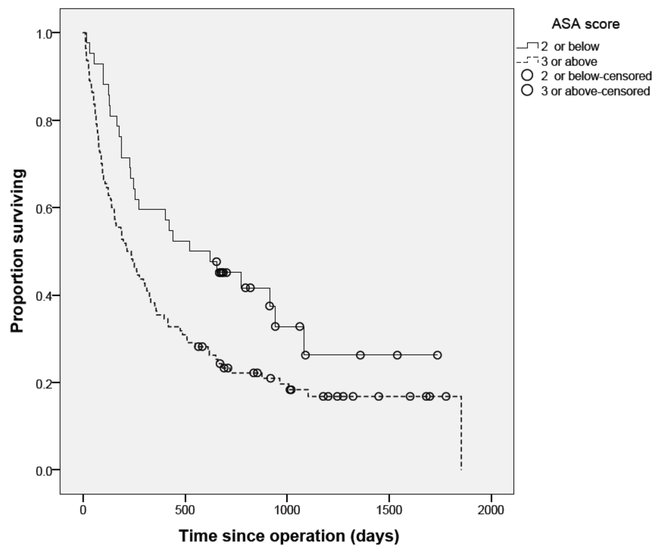

Figure 1. Survival curves for patients with low (≤ 2) and high (≥ 3) ASA scores.

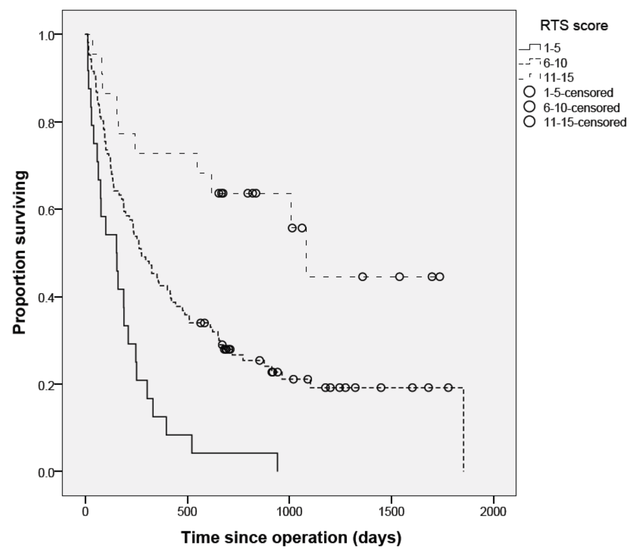

Figure 2. Survival curves with low (1-5), medium (6-10) and high (11-15) RTS scores.

Table 1. Associations of ASA grade and RTS with patient survival.

Variable	Parameter estimate	p-value	Hazard ratio	95% CI for hazard ratio	
				Lower	Upper
ASA score	0.316	0.028	1.371	1.034	1.819
RTS score	-0.195	<0.001	0.823	0.762	0.889

A Cox multiple regression model showed both ASA and RTS scores to be significantly associated with patient survival (Table 1). Each additional point on the ASA scale is associated with a 37% raised hazard of death (p=0.028). Each additional point on the RTS scale is associated with an 18% lowered hazard of death (p<0.001).

Infection status was of substantive importance, with better survival in those without SSI (p=0.075).

Age was not substantively related to survival (*p*=0.299).

Discussion

SSI is the most common complication of surgery for spinal metastases[1]. SSI rates are higher in this group of patients than in those undergoing non-tumour spinal surgery[2]. This study provides some evidence to suggest that those without SSI may survive longer than those with infection, though this result may require further confirmation. Both ASA grade and RTS appear to be useful in predicting survival, with better survival found in patients with higher RTS and lower ASA scores.

Conclusions

Five-year survival in patients undergoing surgery for spinal metastases is approximately 23%. Either or both of RTS or ASA scores can be used as indicators of patient survival. There is currently insufficient evidence to conclude that the presence of SSI retards survival.

References

1. National Collaborating Centre for Cancer. Metastatic spinal cord compression: Diagnosis and management of patients at risk of or with metastatic spinal cord compression. Cardiff: 2008.
2. Olsen MA, et al. Risk factors for surgical site infection in spinal surgery. J Neurosurg 2003;98(2Suppl):149-155.

Acknowledgements

*The **Healthcare Infection Society** is gratefully acknowledged for funding this project through a Small Grant awarded in 2013. Thanks also to Dr Chinari Subudhi for his support with this work.*