Asymptomatic Construct Failure After Metastatic Spine Tumour Surgery: Is It A New Entity Or Continuum To Symptomatic Failure?

TAN Wei Loong Barry; Ravish Patel; Joseph Thambiah; Liu KP Gabriel; Wong Hee Kit; Naresh Kumar
National University Health System, Singapore

Objective

Implant and/or construct failures reported after instrumentation in metastatic spine tumour surgery(MSTS) is low. These failure rates are based on clinical presentations or revisions required for symptomatic failures. Our clinical observation has identified a distinct group of patients with radiological features of implant loosening but are asymptomatic, and a majority did not require revision surgery. We aim to define this subgroup of patients with asymptomatic implant failure (AsCF) and describe the incidence, onset, mechanism, natural history, and associated factors leading to AsCF.

Materials and Method

We performed a retrospective review of prospectively collected data of 288 MSTS patients at a tertiary care institute from 2005–2015. Data collected include demographics, oncological, operative and postoperative variables. Operative details included were number of spinal levels instrumented/decompressed and types of fixation used. Radiological evidence of construct failures was identified based on serial radiographs. Patients with AsCF were analysed for risk factors and survival duration. Competing risk regression analyses were done where AsCF was the event of interest, with symptomatic failure (SF) and death as competing events. Kaplan-Meier survival curves were obtained for patients with AsCF, SF and no failures.

Results

AsCF was observed in 41 patients (16.7%), with none undergoing revision surgery. There were 14 SF (5.7%) patients of which 10 patients underwent revision (4.1%). Average onset of AsCF after MSTS was 2 months(1-9 months). Early AsCF (<3 months from surgery) accounted for 80.5%, while late AsCF were observed in 19.5%. Increasing age ($p<0.02$) and primary breast ($p<0.01$) tumours were associated with higher rates of AsCF. The most common radiologically detectable AsCF mechanisms were angular deformity (increase in kyphosis) in 29 patients and screw ploughing and screw loosening in 15 patients each. There was a trend towards AsCF in patients with SINS>7, instrumentation across junctional regions and construct length of 6-9 levels. The median survival of AsCF patients was 20 months(3-95 months) in patients with early failure and 41 months(11-92 months) in patients with late failure. Average follow-up duration was 20 months. Considering that all patients with SF(14/55) began as AsCF(41/55), it can be deciphered that only one out of four asymptomatic failures progress to symptomatic failure, therefore not always forming a continuum.

Conclusion

The AsCF group did not require any further intervention and most experienced early failure. Late failure was seen in patients who survived longer and maintained ambulation for a longer period. This may be due to the failure of fusion and/or late recurrence of tumours. Increasing age and patients with primary breast tumour have a higher possibility of AsCF. AsCF is not necessarily an indication for aggressive investigation or urgent intervention. However, we recommend frequent follow-up with periodic investigations to detect progressive construct failure. Newer implant materials with improved osteointegration and those that interfere less with radiotherapy should be the future direction for implant-related research in MSTS.