

# Robotic-assisted primary malignant bone tumour resection: A necessity for orthopaedic tumour surgeons in the developing world

**To the Editor:** Approximately 60% of patients treated for primary malignant bone tumours (PMBTs) undergo amputation, owing to the size of their lesion and related local indications.<sup>[1]</sup> Hypothetically, these amputations are avoidable with improved intraoperative tumour margin evaluation and management technologies.<sup>[2]</sup> Robotic-assisted tumour resection is employed to a greater extent by other surgical disciplines; however, there has been slow and somewhat unsupported uptake in orthopaedic oncology.<sup>[3,4]</sup> In our view, orthopaedic oncology patients stand to benefit significantly from the adoption, implementation and further research of robotic-assisted PMBT resections.<sup>[4]</sup>

Robotic-assisted surgery (RAS) is now an established advancement in healthcare provision.<sup>[3,5]</sup> The technology was first used in 1985 in neurosurgery, with the PUMA560 machine for lesion biopsy.<sup>[5,6]</sup> Therapeutic surgical application followed US Food and Drug Administration approval of the use of the da Vinci arm in the year 2000 (Fig. 1).<sup>[5,6]</sup> In oncology, its use has been limited to general surgical benign tumour resection and computer-assisted preoperative planning for complex lesions.

Worldwide audits on the availability of RAS machines reaffirm the disparity of healthcare access in the world. The USA held the highest density of RAS machines, with 70% of all machines, in 2020.<sup>[7,8]</sup> In 2018, 32% of National Health Service hospitals in the UK had at least one RAS machine.<sup>[7,8]</sup> China is second to the USA in its uptake of the technology.<sup>[8]</sup> In Africa and the immediate Middle Eastern countries, the technology is mainly channelled to the private sector via collaboration with private hospitals or orthopaedic companies.<sup>[5,8]</sup> In South Africa (SA), Tygerberg and Groote Schuur public hospitals, both located in the Western Cape Province, are the only public hospitals that have ownership of a RAS machine for state health use.<sup>[9,10]</sup> To our knowledge, no other public hospital in our country owns a robotic surgery machine of any form or kind. Equally, no robotic-assisted bone tumour resection has been performed in the country or on the continent at the time of this review.

The first ever publicised RAS in SA was performed in 2019: a knee replacement done in a private hospital using the MAKO knee surgery

system.<sup>[11]</sup> Since then, there has been accelerated adoption and use by the orthopaedic arthroplasty industry, both in the state and the private sectors. The latter phenomenon is largely driven by industry competition and reported improved patient satisfaction.<sup>[11]</sup>

Tumour resection is a complex and potentially debilitating surgery. In our context of large primary musculoskeletal bone tumours at presentation, the establishment and adoption of robotic-assisted tumour resections have the potential for improved limb salvage procedures and minimised surgical amputation rates.

The establishment of a new RAS platform could cost anything between ZAR19 million and ZAR32 million.<sup>[5,10]</sup> Within the current SA healthcare system context, widespread implementation of such RAS for public hospitals is almost impossible. With the existing public-private partnerships in orthopaedic tumour surgery, the establishment of tumour-dedicated RAS units is potentially achievable and reproducible. We appeal for collaboration and ongoing support, especially in the oncology sector, where most patients are not even comprehensively covered by medical aid funders.

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Fig. 1. The da Vinci arm's original specification.<sup>[6]</sup>

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