

The complex and combined effect of gender, age, body mass index, and tumour site on postoperative colorectal cancer outcomes

Simon Wilkins^{1,2}, Mohammad Asghari-Jafarabadi³, Raymond Yap¹, John Paul Plazzer¹, Paul McMurrick¹

1. Cabrini Monash University Dept. of Surgery, Cabrini Hospital 2. Dept. of Biochemistry and Molecular Biology, Monash University 3. Cabrini Research, Cabrini Hospital

Background

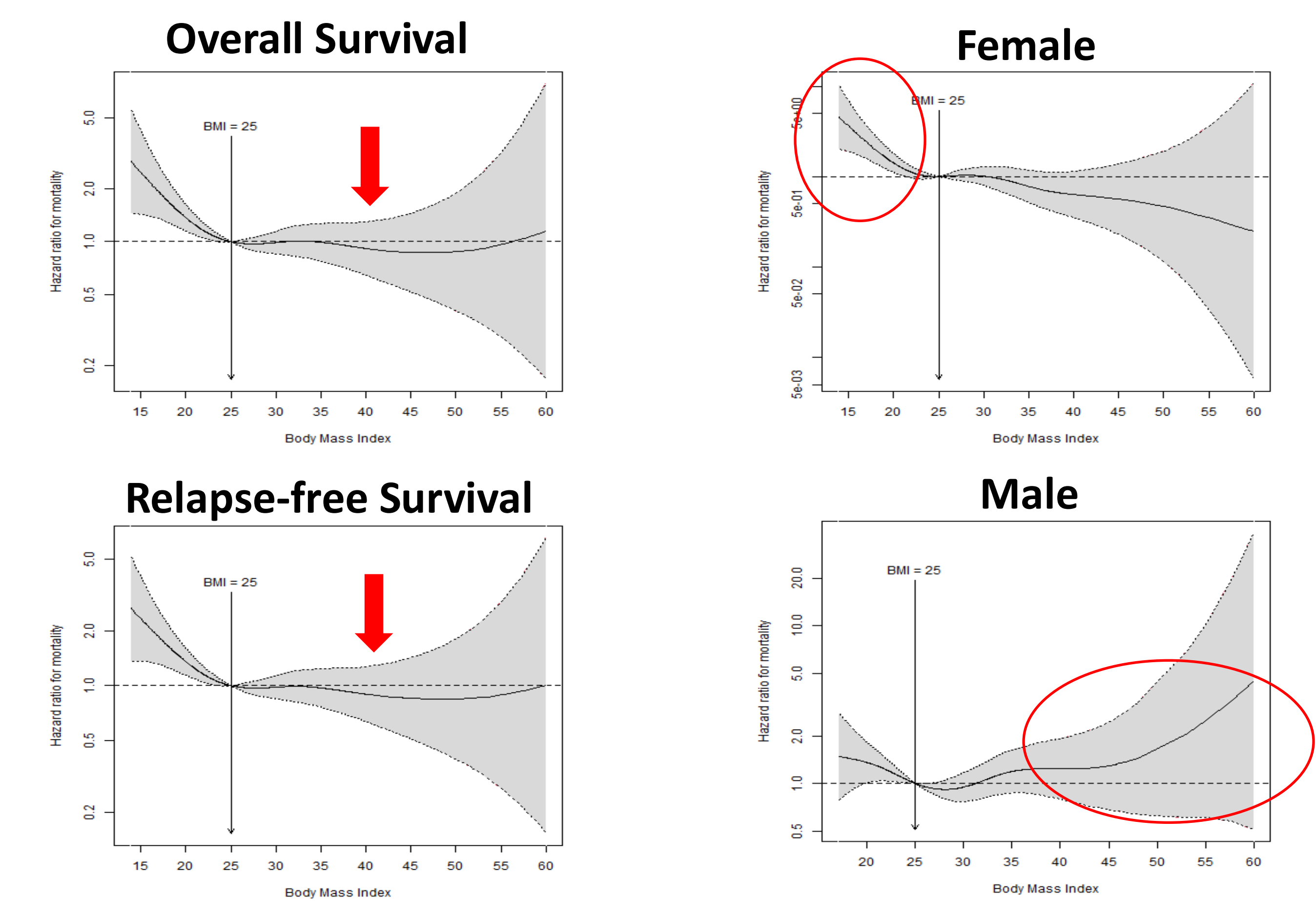
Colorectal cancer (CRC) is common in Australia, with over 15,000 cases reported yearly. High body mass index (BMI) values in patients are often considered a risk factor for poorer outcomes after surgery for CRC, although there are contrasting results in the literature. A Chilean study of 449 patients found there was no difference in the rate of postoperative complications between obese and non-obese patients (1). In our previous study of 1,464 patients, high BMI values were associated with a higher likelihood of conversion of laparoscopic surgery to open and a higher rate of surgical complications (2). This study aimed to investigate the effect of high and low BMI levels on postoperative outcomes following CRC surgery.

Methods

A retrospective analysis of prospectively collected data was carried out on patients undergoing surgery for CRC between 2010 and 2023 at multiple private and public hospitals. Patients were divided into four groups based on BMI (<18.5 (underweight), 18.5-25 (normal), 25-30 (overweight), >30 (obese)). BMI was considered as a categorical variable and as a continuous variable. Patient characteristics, operative data, pathology and postoperative outcomes were analysed.

Abbreviation: American Society of Anesthesiologists (ASA).

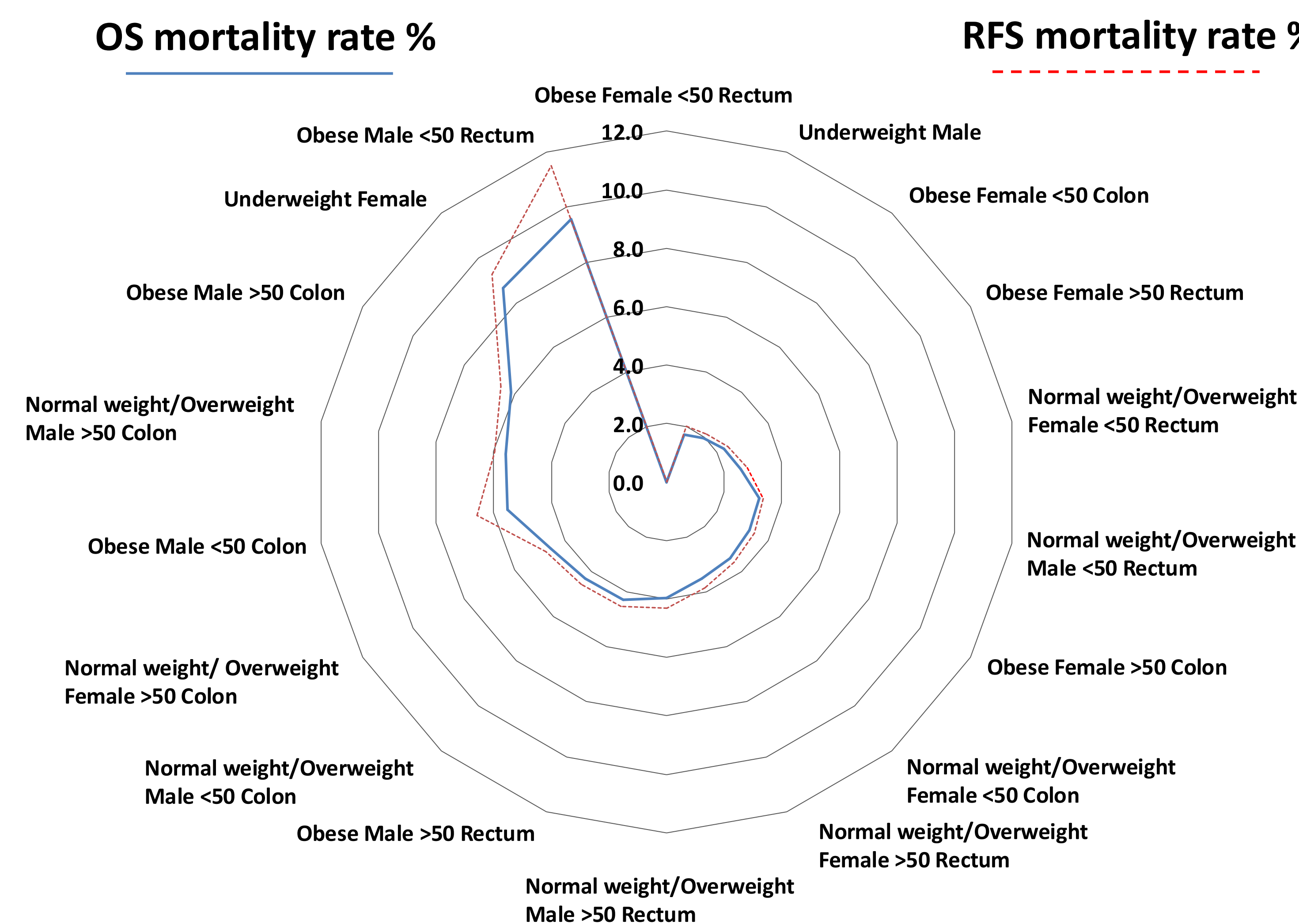
Figure 1. Smooth Hazard ratio plots-BMI as a continuous variable



Results

5,201 patients were identified, with 53% male. 78% of underweight patients were female, and more obese patients were ASA 3 or 4 than normal-weight patients. High BMI (>30) patients had a higher rate of laparoscopic to open conversions (4.6% vs 8.8%; $p<0.001$). High BMI patients had a higher rate of stage 1 cancers and a lower rate of stage 4 cancers ($p=0.001$). Medical complications, surgical complications, wound infection and 30-day mortality were significantly different between the four BMI groups. Age, gender, tumour location and BMI were key factors in overall (OS) and relapse-free survival (RFS). Analysing BMI as a continuous variable revealed that overweight and obese patients had improved survival (Fig. 1 arrows). Underweight and obese patients were the most at-risk groups in female and male patients, respectively (Fig. 1 circled). Combinations of age (< or >50), gender, BMI group, and tumour location showed complex patterns of OS and RFS survival (Fig. 2).

Figure 2. Radar plot of combined factors affecting outcome



Conclusions

The effect of BMI on CRC post-operative outcomes is complex. Analysis of categorical BMI values shows that in the short-term outcomes, there are variations between the four BMI groups. Analysis of BMI as a continuous variable reveals four key risk factors for postoperative outcomes: age, gender, BMI, and tumour location. When these factors are combined, a complicated picture of postoperative risk is shown, which may have implications for patient care.

Acknowledgements

The authors thank the colorectal surgeons for providing their patients' data for this project. We thank LBBC (www.letsbeatbowelcancer.com) for financial support during this project.

References

1. Estay et al 2014 *Surg. Endosc.* 28 2090-2096
2. Bell et al 2018 *Colorectal Disease* 20 778-788