The incidence of prostate cancer increases with age and 75 per cent of cases are diagnosed in men aged 65 years and over. This age group also has an increased risk of cardiovascular disease and diabetes mellitus and therefore many men will have the comorbidities described in our case.

Androgen deprivation therapy (ADT) is the gold-standard first-line treatment for metastatic prostate cancer and patients often remain on treatment for several years. In this article we will discuss the metabolic consequences of ADT (with particular emphasis on the case above).

**WHAT IS THE METABOLIC SYNDROME?**

There is no consensus on the definition of the metabolic syndrome. It is generally agreed to be a cluster of factors that increase the risk of cardiovascular disease and diabetes. Insulin resistance and excess fatty acids are the main underlying factors, with hypertension and obesity often associated.

The most commonly used criteria are set out in the National Cholesterol Education Program, Adult Treatment Panel III (Box 1); three of the five criteria need to be met. Use of medication to lower lipids, blood pressure and serum glucose levels should be counted towards the criteria.3

The International Diabetes Federation also has a worldwide consensus definition based on central obesity (waist size >94cm for men) and at least two of the following criteria:

- raised triglycerides (>150mg/l or following specific treatment)
- reduced high-density lipoprotein (<40mg/dl in men)
- elevated blood pressure (>130/85mmHg)
- elevated fasting glucose (>5.5mmol/l or diabetes)

**THE EXTENT OF THE PROBLEM**

According to the International Diabetes Federation, 25 per cent of adults have the metabolic syndrome. People with the metabolic syndrome are twice as likely to die from and three times as likely to have a
Cardiovascular death is now the single most common cause of non-prostate cancer-related death, and non-prostate cancer-related deaths now exceed prostate cancer-related mortality in many countries. We know that hypogonadism caused by luteinising hormone-releasing hormone agonists results in abnormalities such as reduced lean body mass and increased obesity that factor in the metabolic syndrome. The increased subcutaneous and visceral fat that results in the enlarged abdominal girth also contributes to insulin resistance, which may result in diabetes.

Levine and colleagues reviewed the literature, examining the the association between ADT and cardiovascular morbidity and mortality. The results varied, with significant data showing that ADT causes adverse effects on serum lipoproteins, insulin resistance and central obesity. In one large study, time to cardiovascular morbidity and mortality were both reduced in those treated with ADT, but results from other studies are markedly mixed, with some showing no association. Further prospective studies are suggested by the authors in order to fully evaluate this relationship.

SCREENING AND MONITORING
A detailed medical history and examination prior to initiation of ADT is needed, with specific focus on pre-existing cardiac conditions and cardiac risk factors. By identifying these factors before starting ADT, the patient and doctor can adopt a proactive approach to treat them at this stage before they may be worsened by ADT. Regular monitoring is recommended of weight, blood pressure, serum lipids and fasting blood glucose. Metabolic changes occur early, often within three to six months of starting treatment. The first assessment for risk factors should occur at three months and at three-monthly intervals after this.

TREATMENT
Treatment is directed at the individual risk factors. These should be actively managed using lipid-lowering agents for hyperlipidaemia, antihypertensives for hypertension, glucose-lowering agents for diabetes, antiplatelet agents for secondary prevention and lifestyle changes. Before and during ADT, the importance of lifestyle changes such as smoking cessation, weight control and a healthy diet should be emphasised to the patient. A study evaluating the impact of resistance exercise in men receiving ADT for prostate cancer demonstrated significantly improved fatigue levels and quality of life compared to the control group.

CONCLUSION
Our case involves a man with newly diagnosed metastatic prostate cancer who already has angina and diabetes. Androgen deprivation therapy is integral to managing his prostate cancer but may worsen his angina and/or diabetes. Awareness of the consequences of androgen deprivation allows him and his medical team to monitor and treat risk factors that are likely to worsen his cardiovascular disease and diabetes.

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REFERENCES