

**ANSWER TO PHOTO QUIZ (PAGE 43)**  
**AN OLD MALE WITH MULTIPLE HOTSPOTS ON  $^{18}\text{F}$ -FDG PET-CT**

## DIAGNOSIS

The high  $^{18}\text{F}$ -FDG uptake is located in adipose tissue cranial of the trapezius muscle and at multiple paravertebral adipose locations, most likely reflecting metabolically active brown adipose tissue (BAT) (*figure 1*). Metabolically active BAT is a relatively common finding on diagnostic  $^{18}\text{F}$ -FDG PET-CTs with a prevalence of 2-9%.<sup>1</sup> In newborns and children, BAT functions to maintain a stable core temperature by converting calories into heat, when surrounding temperatures drop. In general, the prevalence of active BAT on diagnostic  $^{18}\text{F}$ -FDG PET-CTs significantly decreases with increasing age, body mass index (BMI) and/or outdoor temperatures.<sup>1</sup>

In prospective BAT research, where BAT is activated using cold exposure before the  $^{18}\text{F}$ -FDG PET-CT, the prevalence of detectable BAT in elderly patients aged over 60 is very low.<sup>2</sup> Furthermore, on diagnostic  $^{18}\text{F}$ -FDG PET-CTs, active BAT is more frequently seen in women than in men.<sup>1</sup> Indeed, in cell cultures, testosterone has been shown to inhibit the thermogenic response of BAT.<sup>3</sup> Accordingly, the chance of detecting active BAT in a male patient aged over 60 on a diagnostic  $^{18}\text{F}$ -FDG PET-CT is close to zero.

The reason for activation of BAT in this relatively old male might be that the patient was affected by active cancer. The cancer cells might secrete factors that upregulate the expression of genes involved in thermogenesis, leading to activation and/or recruitment of BAT. These mechanisms are closely related to the wasting processes observed in cancer-associated cachexia.<sup>4</sup> At the moment of the  $^{18}\text{F}$ -FDG PET-CT scan, the patient had lost approximately 3.5 kg in the past four months and had a BMI of 21.1 kg/m<sup>2</sup>.

Furthermore, the scan was performed in January. The outdoor temperatures during that day (mean temperature of 7.9 °C with a minimum of 5.8 °C and a maximum of 10.3 °C) but also during the month were low (mean temperature 4.0 °C with a minimum of 1.5 °C and a maximum of 6.41 °C) obtained from sourcing data from the Royal Netherlands Meteorological Institute (KNMI, <https://www.weerstatistieken.nl>). The low outdoor temperatures might have also contributed to the finding of active BAT.

Although the finding of metabolically active BAT in an old male is rare, it underlines the potential of BAT to regenerate/reactivate in an old male. This finding is important since obesity is apparent in all age categories, including the elderly. Therefore, BAT might be recruited/reactivated in elderly people and thereby function as a target in the treatment of obesity, also in the elderly. On the other hand, this case underlines the importance of adequate preparation of patients undergoing  $^{18}\text{F}$ -FDG PET-CT scans. Active BAT can hamper the interpretation of diagnostic scans especially leading to false-positive negative findings. BAT activity can easily be downregulated by increasing room temperature in preparation of the scan. However, in some cases this is not enough to decrease BAT activity. In cases of persistent BAT activity, administering  $\beta$ -blockers prior to the scan may be helpful since  $\beta$ -blockers have been shown to be very effective in blocking BAT activity. The patient was treated with neoadjuvant chemoradiation and eventually died of complications following the subsequent transthoracic oesophagus-cardiac resection.

## DISCLOSURES

The authors declare no conflicts of interest.

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