Bone and muscular viability assessment before amputation: usefulness of bone scan and ^{99m}Tc sestamibi dual-phase scintigraphy

Steve Durante,[1] Maria Helena Perez,[2] Anthony De Buys Roessingh,[3] Ariane Boubaker[4]

[1]Department of Radiology, Centre Hospitalier Universitaire Vaudois, Lausanne, Switzerland
[2]Pediatric Intensive Care Unit, Centre Hospitalier Universitaire Vaudois, Lausanne, Switzerland
[3]Department of Pediatric Surgery, Centre Hospitalier Universitaire Vaudois, Lausanne, Switzerland
[4]Department of Nuclear Medicine, Centre Hospitalier Universitaire Vaudois, Lausanne, Switzerland

Correspondence to
Dr Steve Durante,
steve.durante@me.com

Accepted 9 October 2017

DESCRIPTION

^{99m}Tc-sestamibi has been used to evaluate metabolic muscle abnormalities since 25 years.[1] Uptake and retention in myocytes correlates with mitochondrial content and has been used to evaluate muscle functionality and viability.[2]

A 2-year-old boy presented with extensive musculoskeletal necrosis due to streptococcal septicaemia. Level of amputation of right arm was modified during surgery, necrosis being far more extensive than predicted by a preoperative MRI. Therefore, a bone scan was done to assess perfusion and bone viability before amputation of both legs (figure 1). Bone viability was demonstrated for both femurs and proximal left tibia. Muscle viability being essential for functionality, a two-phase ^{99m}Tc sestamibi (10 min and 4 hours postinjection) was done 2 days after (figure 2).[3]

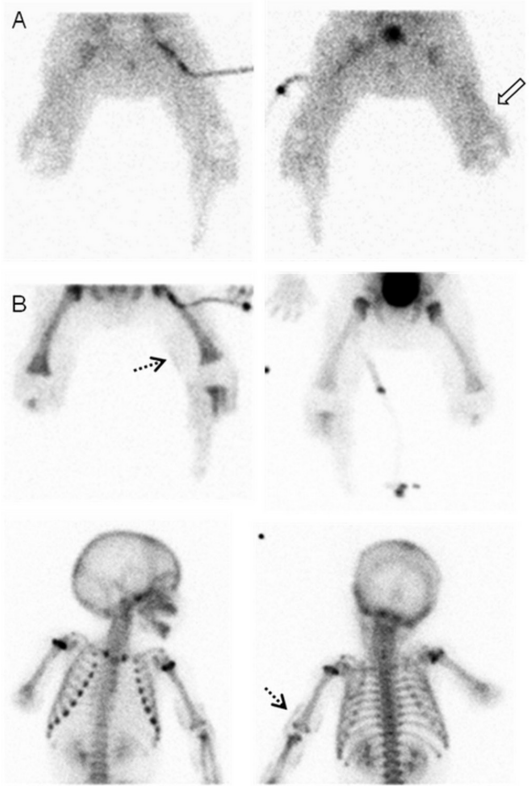

Figure 1 Bone scintigraphy demonstrated soft-tissue viability in both thighs and proximal left leg on bloodpool images (A). Soft-tissue uptake in anterior left thigh (open arrow) suggested inflammation. Delayed views confirmed bone viability of femurs and proximal left tibia (B). Subcutaneous activity (dashed arrows) corresponded to necrosis.

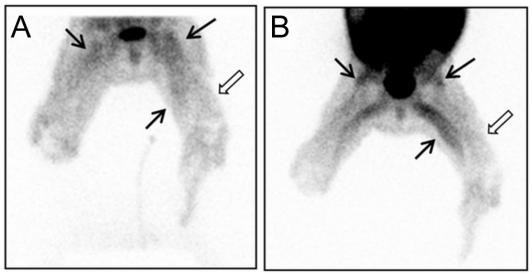

Figure 2 Early (A) and delayed (B) anterior projections after ^{99m}Tc sestamibi injection demonstrated muscle viability in medial thighs and pelvis (plain arrows). Lack of delayed activity (open arrow) was consistent with necrosis/inflammation, corresponding to bloodpool phase of bone scintigraphy.

Early sestamibi activity was observed in the distal left quadriceps, but increased delayed uptake was clearly seen in adductor, gluteus and proximal quadriceps, assessing viability.

Surgery was conservative relying on bone and muscle scintigraphy, and clinical outcome was favourable with preserved functionality of both thighs.

Contributors SD analysed the bone and muscle scans, wrote the article and gave the consent form to the patient. MHP is a paediatrician in the paediatric intensive care unit and followed the patient at the hospital before and after surgery. She helped in correcting the article (clinical part). She was the one who asked for the examinations with ADBR. ADBR is the paediatric surgeon who asked for the examinations and performed the surgery. He also helped in the correction of the clinical part of the article. AB supervised the work, helped in analysing images, wrote the article and had the idea to publish it. She is a nuclear medicine doctor.

Competing interests None declared.

Patient consent Guardian consent obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

Learning points

- ^{99m}Tc-sestamibi shows muscle viability in case of soft-tissue and muscle infection with potential necrosis.
- ^{99m}Tc-sestamibi can help to refine the level of extremity amputation before surgery in combination with bone scintigraphy.
- ^{99m}Tc-sestamibi can predict healing of extremity amputation.

To cite: Durante S, Perez MH, De Buys Roessingh A, *et al*. *BMJ Case Rep* Published Online First: [*please include* Day Month Year]. doi:10.1136/bcr-2017-222258

REFERENCES

1 Piwnica-Worms D, Kronauge JF, Chiu ML. Uptake and retention of hexakis (2-methoxyisobutyl isonitrile) technetium(I) in cultured chick myocardial cells. Mitochondrial and plasma membrane potential dependence. *Circulation* 1990;82:1826–38.
2 Cittanti C, Colamussi P, Giganti M, *et al*. Technetium-99m sestamibi leg scintigraphy for non-invasive assessment of propionyl-L-carnitine induced changes in skeletal muscle metabolism. *Eur J Nucl Med* 1997;24:762–6.
3 Sarikaya A, Top H, Aygit AC, *et al*. Predictive value of 99mTc-sestamibi scintigraphy for healing of extremity amputation. *Eur J Nucl Med Mol Imaging* 2006;33:1500–7.