DR THABO LENGANA

Academic Fellowship Award

University of Pretoria

Nuclear medicine

Half-way through his registrar years, University of Pretoria and Steve Biko Academic Hospital nuclear physician, Dr Thabo Lengana, liked nothing more than picking a backing riff on his bass guitar for his band of musician friends.

"We did mostly jazz, but also rhythm and blues – that was when I still had time to relax. Not since this PhD though. Right now, it's motivating me to finish this research so I can get back to it!" he chuckles when asked about his hobbies.

There's a wonderful metaphor between his potentially ground-breaking current research (into the superior efficacy of an injectable tracer agent in detecting recurring prostate cancer) and his musical role as a bassist. According to a study published in the National Academy of Sciences, our brains can find a song's rhythm more accurately by listening to the low tones played on the bass. While musicians love to joke otherwise, the bassist is the most important member in a band.

Thabo's "low-tones" in his current research are already fine music to the ears of physicians involved in detecting and treating prostate cancer. Through his research he hopes to publish the score on how accurate the injectable ^{18}F-Prostate-Specific-Membrane-Agent (PSMA) 1007 is during scans.

How unique injectable tracer works

^{18}F-PSMA 1007 is a tracer agent that travels through the bloodstream, singling out and only locking onto cancerous cells that express PSMA. Thabo is part of a small group of South African nuclear physicians who punch well above their weight globally in 'theranostics' – an approach where tracer agents are both diagnostic and therapeutic.

He's using his PhD enquiry, backed by a Discovery Academic Fellowship, to study patients with prostate cancer who present with biochemical recurrence after surgery or radiation.

While there are other PSMA tracers, their limitation is that they are excreted mainly via the kidney into the bladder. 'Agent 1007' is mainly cleared out by the liver into the gall bladder. This means ^{18}F-PSMA 1007 avoids depositing visually obstructive tracer elements in the bladder, thus rendering the pelvic floor fully observable during a scan.

Thabo explains that about one third of prostate cancer patients will have a recurrence of the disease most commonly where the prostate gland is situated (below the bladder).

"If the bladder is full of tracer, it obscures the prostate and we can't visualise the prostate bed," he emphasises.

Multiple benefits

With recurring prostate cancer, patients often have a surgical scar or fibrosis (from radiation treatment), meaning that dead and fibrotic tissue can render the identification of active disease difficult during a standard MRI or CT scan.

By locking only onto cancer cells, ^{18}F-PSMA 1007 side steps this problem too, eliminating any confusion between cancerous cells and fibrotic or dead tissue. Thabo says this involves a whole-body scan with Positron-Emission Tomography (PET-scan), a nuclear medicine imaging technique used to observe metabolic processes in the body.

This enables precise identification of cancerous sites and therefore enables accurate radiation.

“We can see where it’s hiding, whereas other scans and agents can miss it – it’s a very real, unmet diagnostic need,” he adds.

His hope is that the findings of his research will demonstrate an increased sensitivity and lesion detection of prostate cancer cells at low prostate-specific-antigen (PSA) values that will result in ^{18}F-PSMA 1007 replacing MRI and CT scans as the imaging standard in patients with recurrent cancer.

The audience applause, however, is reserved for the therapeutic version of PSMA. This destroys the cell DNA of the cancer cells. “So, we first identify the site of the cancer with the tracer ^{18}F-PSMA 1007. Then, we inject a therapeutic version of the PSMA tracer, which locks onto the PSMA-expressing prostate cancer sites and gives off radiation that kills the cancerous cells while by-passing normal tissue that does not express PSMA,” he explains.

He says this theranostic approach has been available globally for about five years and accessible to his scientific team for about the same length of time. By mid-May 2019 they had reached their data analysis phase. If all goes to plan, they’ll be publishing by mid-2021.

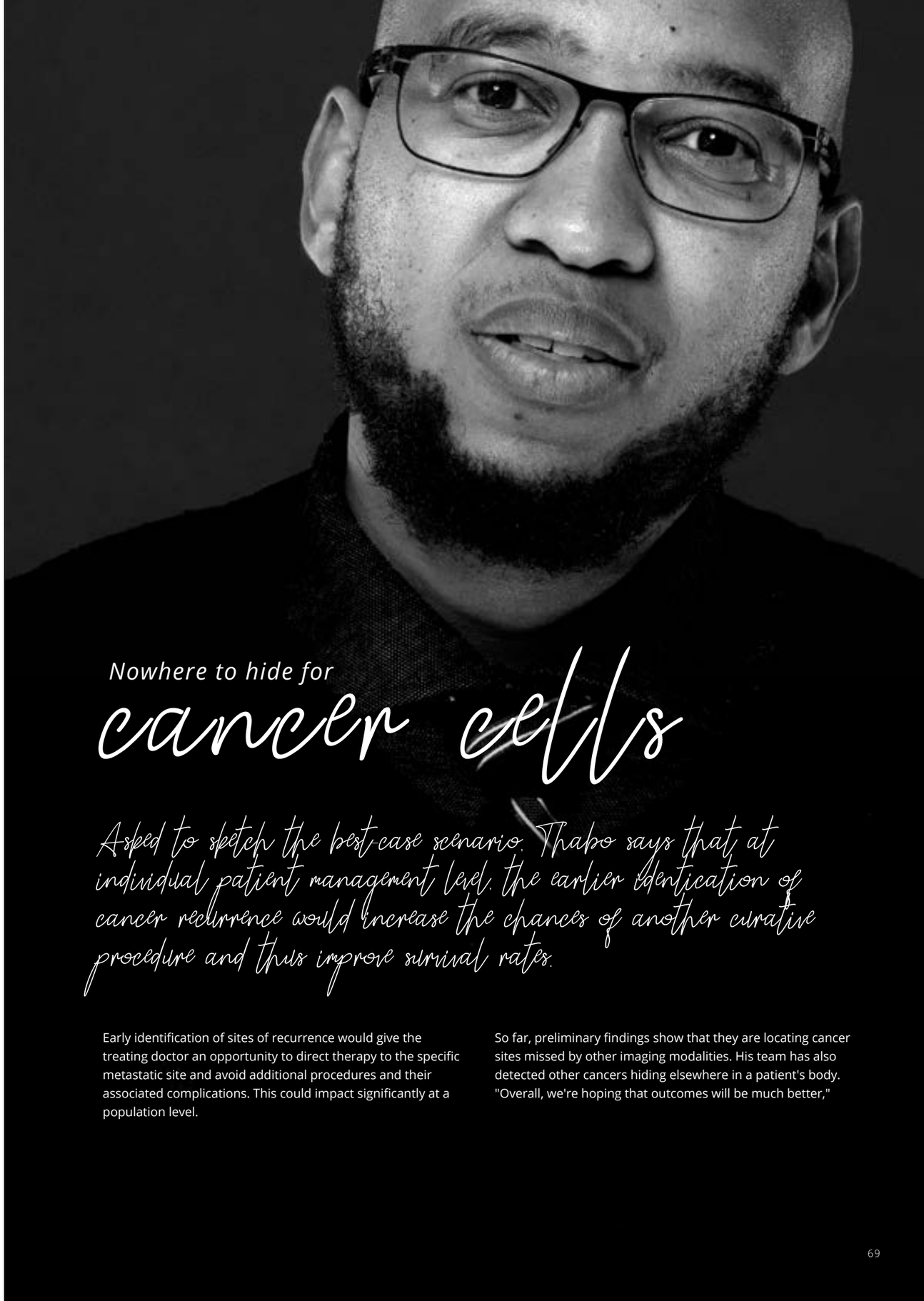
“Overall, we’re hoping that outcomes will be much better,” he adds.

Asked what led him to medicine and research, Thabo says he can’t single out an event, but remembers being around his father’s doctor friends and thinking, “this will be a great thing to do.” He speculates that perhaps the influence was deeply unconscious because as an infant he was very sickly and would be in and out of hospital.

As a middle child whose father worked for a global petroleum company and whose mother took care of them at home, Thabo says his parents; “did the best they could with what they had.”

He’s married to a doctor working in healthcare risk management, and they have a daughter who is four years old.

His bass guitar case remains clipped shut. Yet, like his research, he can feel its promise and cannot wait to get back to grips, laying down those fundamental bass notes again.



Nowhere to hide for

cancer cells

Asked to sketch the best-case scenario, Thabo says that, at individual patient management level, the earlier identification of cancer recurrence would increase the chances of another curative procedure and thus improve survival rates.

Early identification of sites of recurrence would give the treating doctor an opportunity to direct therapy to the specific metastatic site and avoid additional procedures and their associated complications. This could impact significantly at a population level.

So far, preliminary findings show that they are locating cancer sites missed by other imaging modalities. His team has also detected other cancers hiding elsewhere in a patient's body. "Overall, we're hoping that outcomes will be much better,"