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Tuesday, October 06, 2020

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# Explained: How an MRI machine killed a man in Mumbai

Bombay High Court has directed BMC to pay interim compensation of Rs 10 lakh to the family Rajesh Maru, who was killed after he was sucked into an MRI machine at BYL Nair Hospital in January 2018.

By: [Explained Desk](#) | Mumbai | Updated: September 19, 2019 9:56:20 pm



The MRI unit is divided into four zones. (Representational Image)

The Bombay High Court this week directed the Brihanmumbai Municipal Corporation (BMC) to pay Rs 10 lakh as interim compensation to the family Rajesh Maru, a resident of Lalbaug, who was killed after he was sucked into an MRI machine in the city's civic authority-run BYL Nair Hospital in January 2018.

Maru's family has sought a compensation of Rs 1.42 crore, and asked the court to issue directions to lay down guidelines to avoid such incidents in the future. Ordering the interim compensation, the High Court said the hospital authorities cannot escape liability for their negligence.

This is the story of Maru's extraordinary death — how MRI machines work, and how they can, in rare cases, kill.

## **What happened**

On January 27, 2018, Laxmi Solanki, a 65-year-old patient at Nair Hospital, was wheeled on an iron-steel trolley from the Medical Intensive Care Unit (MICU) to the Magnetic Resonance Imaging (MRI) unit.

The elderly patient was on oxygen support at the time. An MICU ward boy named Vitthal Chavan, Dr Saurabh Lanjrekar of the hospital's Department of Medicine, and the patient's relatives, Harish Solanki, Priyanka Solanki, Tribhuvan Solanki, and Rajesh Maru accompanied her.

At the Radiology Department (where the MRI facility is), Dr Siddhant Shah and an ayah, Sunita Surve, were present, but the ward boy of the Radiology department and the Radiology technician were not.

According to the family, this is what happened: Laxmi's iron trolley was wheeled into Zone III in violation of procedure, and the patient was then shifted to the special MRI trolley and taken to a room next to the room that has the MRI machine (Zone IV). (Details in next section below)

At the same time, Maru, who was holding the oxygen cylinder with his left hand, his fingers wrapped around the cylinder's nozzle, stepped through the door into Zone IV.

The next instant, Maru, still holding the cylinder, flew off his feet “like a missile” and slammed into the gantry of the machine a few feet away.

The cylinder’s knob snapped, and with his upper body lodged halfway inside the machine’s circular hollow, Maru inhaled a rush of oxygen. Pneumothorax — a condition in which air (or other gas) fills the space between the lungs and chest wall, and the lungs collapse — followed.

The machine was switched off, and the war boy Chavan, the family, and the doctors pulled Maru out. One of his fingers, stuck between the broken cylinder knob and the gantry’s magnetic wall, was severed. “He had bloated like a balloon,” Maru’s brother-in-law Harish Solanki said. Maru was declared dead at the Emergency Ward.

### **Layout of the MRI unit**

The MRI unit is divided into four zones. Zone I is the reception area, where no safety measures apply. Patients and attendants take off their belts, jewellery, hairpins, rings, ATM and credit cards, etc., and leave behind their wallets and mobile phones.

Zone II is where the patient is changed into a hospital gown and transferred to a special MRI-compatible aluminium trolley. According to what the family claimed to reporters at the time of the incident, the trolley was changed only in Zone III.

Zone III is the console room, which has the computer that controls the MRI machine. Entry is restricted here. Finally, Zone IV of the MRI unit is where the actual machine is kept. In Nair Hospital, it is a 600 square-foot space, the door has a warning sign, and the machine is four-five feet inside the door.

### **MRI machines**

MRI scanners have giant electromagnets with field strengths of between 0.5 tesla and 1.5 tesla. For reference, a fridge magnet is about 0.001 tesla, and the Earth’s magnetic field is 0.00005 tesla. The MRI machine at Mumbai’s Nair Hospital had a strength of 1.5 tesla — that is, 1,500 times more powerful than a fridge magnet and 30,000X the geomagnetic field.

## **This is how an MRI scanner works:**

The human body is mostly water (hydrogen and oxygen), and when in the massive, stable magnetic field of the scanner, the hydrogen protons get aligned in the same direction. A radiofrequency source is then switched on and off, repeatedly knocking the protons out of line and back into alignment. Receivers pick up radio signals that the protons send out, and by combining these signals, the machine creates a detailed image of the body's inside.

Because of the machine's giant magnetic field, hospitals and diagnostic centres issue detailed guidelines to ensure no metal objects are brought close. For patients (like Laxmi) who need oxygen during the scan, the MRI room has an MRI-compatible tube to supply oxygen.

### **'Always-on' field**

Maru's family had claimed at the time of the incident that the ward boy, Chavan, had told them that the machine hadn't been switched on yet. However, an MRI machine's magnetic field is on even when it isn't actually scanning.

A sign on the door of the MRI room at the hospital shows a magnet inside the triangle that is universally recognised as a symbol of warning, along with the legends "Strong Magnetic Field" and "Magnet is Always On". The word 'always' is underlined.

An emergency button can be used to demagnetise the machine. However, radiologists say this can be dangerous. The liquid helium that maintains the magnet's temperature may vaporise, leading to an accident. In Maru's case, doctors chose to turn off the machine before trying to pull him out.

### **Accidents while scanning**

MRI scans have been widely used since the early 80s, and tens of millions of scans are done every year across the world. Deaths like Maru's are extremely rare. Only one earlier event — a six-year-old boy was killed in the United States after an oxygen cannister drawn by the magnet smashed into his skull in 2001 — is well known.

Mumbai saw a serious accident in November 2014. At the Advanced Centre for Treatment, Research, and Education in [Cancer](#), Navi Mumbai, ward boy Sunil Jadhav had mistakenly brought in an oxygen cylinder. He and the cylinder were pulled in, and they took technician Swami Ramaiah, who was in the way, along. Ramaiah, who was stuck in the machine for 4 hours, temporarily lost sensation waist downward, suffered kidney damage and urinary bladder puncture.

The commonest injuries are burns, which can be severe. Loud noises in some older machines can result in hearing loss.

### Safety protocol

In India, diagnostic centres doing radiation tests such as X-ray or CT scan must have Atomic Energy Regulatory Board (AERB) approval, and follow AERB guidelines. But MRI scans involve no radiation, and the guidelines do not apply. Precautions are taken as advised by the machines' manufacturers.

The United Kingdom has the Ionising Radiation (Medical Exposure) Regulation, 2000, but it does not apply to MRI scans. The Royal Australian and New Zealand College of Radiologists has formulated MRI Safety Guidelines, but they too, are not mandatory.



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