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IIT-B & docs use nanotech to treat cancer

Malathy Iyer | TNN

Mumbai/Hyderabad: If it does pass the muster, it could be India's second 'nano' success story. Only this nano creation is being unveiled in the field of healthcare thanks to collaboration between oncologists and scientists of the Indian Institute of Technology-Bombay. In a step that has the potential to revolutionise treatment of retinoblastoma—a rare cancer of the retina that mainly affects children under two years of age—the IIT-B and doctors from Tata Memorial Hospital in Parel and Apollo Hospital in Hyderabad have developed a nano-particle that could conquer the child killer.

Guntur-based teenager, Shirin Thakur, has been suffering from recurrent retinoblastoma since she was two years old. Last week, she took the third shot of a special concoction—nano-particles of carboplatin that is commonly used to treat retinoblastoma—into the tissues around her left eye. Standing in an antiseptic corner of Apollo Hospital in Hyderabad along with her doctor, Dr Debraj Shome, who has been working on the project for five years, the 17-year-old said: "I have been suffering from attacks of retinoblastoma in my left eye since I was two. Even in the US,

CURE FOR RARE EYE CANCER IN SIGHT?



RETINOBLASTOMA is a cancer that begins in the retina, the sensitive lining that helps us see. It most commonly affects young children

INCIDENCE

Childhood: The incidence is **one** in **10,000 to 15,000** births

SIGNS

- White colour in the pupil
- Eyes that appear to be looking in different directions
- Eye redness
- Eye swelling

NANO ROUTE

Doctors at Tata Memorial Hospital in Parel, L V Prasad Eye Hospital and Apollo Hospital in Hyderabad, with IIT-B's scientists, have begun phased clinical trials of nano-particles of an existing drug used to treat retinoblastoma. Last week, Shirin Thakur (17) was injected with nano-particles of carboplatin. The injections were given at the tissues near the eye. Shirin says her vision "gets better" with every passing day

they told me there is no hope but to remove my eye." Now, she has "fuzzy" vision in the nearly blind eye. "My vision gets better every day."

Twelve-year-old Vasu, son of a farmer from Vijayawada, says he has been able to see better since September 2009, the time he became a part

of the trial. If all goes well, there need not be any more reel-life Paarshas who, in the film *Shwaas*, India's entry to the Oscars in 2004, lost both his eyes due to retinoblastoma.

► Multicentric trials in the offing, P 8

Clinical trials poised to go multicentric

Malathy Iyer | TNN

Mumbai/Hyderabad: Shirin and Vasu are the first two patients to undergo clinical trials of the new drug at Apollo's Hyderabad hospital. "We will do nine more patients here before embarking on a multicentric study beginning at Cleveland Eye Clinic, Ohio next year," says Dr Debraj Shome, who is part of collaboration between IIT-B scientists and doctors from Tata Memorial Hospital in Parel and Apollo Hospital in Hyderabad. Incidentally, when Shirin travelled to Wills Eye Institute in Pennsylvania a year ago, she was told that the retinal cancer in her left eye was incurable.

It was a chance meeting between Shome and Prof Jayesh Bellare from IIT-B's chemical engineering department that started off this nano-drive. "IIT-B is the pioneer in nanotechnology for healthcare applications. We started work on nano-technology more than six years back," says Bellare, whose works in the field

na-blood barrier, increase the amount of medicine acting on the cancer site and thus cure it.

The first trials of the earlier versions of the nano drug were done on animals at Tata Memorial Hospital's research centre called ACTREC in Kharghar in 2006-07. Terming the initial work as "promising", Dr Rajiv Sarin, director of ACTREC, told TOI that "in a research work done in collaboration with IIT-B, we did work on rabbits in our labo-

considered one of the leading ophthalmologists working in the field retinoblastoma.

He says that 5,000 new cases are reported across the world every year. "Of this, 1,500 come from India. What is sad is that in India, over half the patients come to doctors only after the disease is so advanced that the eyes has to be removed." Dr Pritam Samant, who is attached to Mumbai's J J Hospital that is a referral centre for retinoblastoma cases, says that nano-particles have

RAY OF HOPE

RETINOBLASTOMA, which is a cancer that starts in the retina, most commonly affects young children and rarely adults

THE CHALLENGE

Getting drugs to adequately penetrate the retina has always been a challenge. While existing drugs do manage to reach the retina through a circuitous route via an intravenously delivered passage, it was always felt that better delivery would ensure quicker recovery

5 YRS OF RESEARCH

Phase I: In 2005-06, doctors first started injecting drugs meant for chemotherapy locally into eye cancers

Phase II: In 2007, IIT-B develops a nano-molecule of carboplatin (one of the many chemotherapy drugs used to treat retinoblastoma). The work is published in an

have appeared in several scientific journals.

At an ophthalmology conference over four years ago, he met Shome and they got discussing how delivering drugs to a cancer-hit retina is always an uphill task. "The retina-blood barrier acts as a natural filter against huge foreign particles," says Shome.

That is when Bellare's 14-member team got into action: they miniaturised carboplatin, a known drug in the market for retinoblastoma. "We first used natural protein or albumin as a carrier for the drug, but decided to look for a new material as there is 0.1% chance that protein could react with normal body tissues and create a side-effect," says Bellare. That is when his team started working with PMMA (poly methyl methacrylate) that is used to prepare lenses used in cataract surgery. "This is an inert material that doesn't react with human tissues," says Bellare, who prepared the PMMA-based carboplatin last year for the ongoing clinical trial at Apollo Hospital.

The logic for the entire experiment is that smaller particles can breach the reti-

ON THE ANVIL

A team of doctors and scientists across India have conducted animal trials and started phased clinical trials of nano particles of an existing drug used to treat retinoblastoma. The idea is to allow maximum molecules to penetrate the retina-blood barrier, which is naturally designed to filter out huge particles. The nano version worked on rabbits and multi-centric clinical trials are on the anvil



BREAKTHROUGH: Prof Jayesh Bellare

scientists developed another nano-molecule of carboplatin. Instead of the earlier protein-based molecule, they used PMMA, a bio-inert substance used to make eye lenses

ratory to assess whether these nano-particles reached the target tissues better."

This work was preceded by collaboration between Shome along Santosh Honavar in L V Prasad Eye Hospital in Hyderabad. They devised a new technique to deliver drugs right next to the eye, which increases the probability of the drug reaching the cancer site.

"The nano-technology drug for retinoblastoma is still in an extrapolatory stage. More experiments are needed before it is accepted across the world," says Honavar, who is

shown promise in animal studies and will certainly help doctors in treating the disease. "At present, even if we use laser to destroy the cancer in the retina, it is difficult to do so in one or two sittings. If we can deliver drugs more effectively to the retina, even one laser session may be enough to do the trick," he adds.

Shome and Bellare hope their nano experiment will do the trick, and not just with retinoblastoma. "There is whole of application for this drug-delivery mechanism in other cancers of the face and brain."