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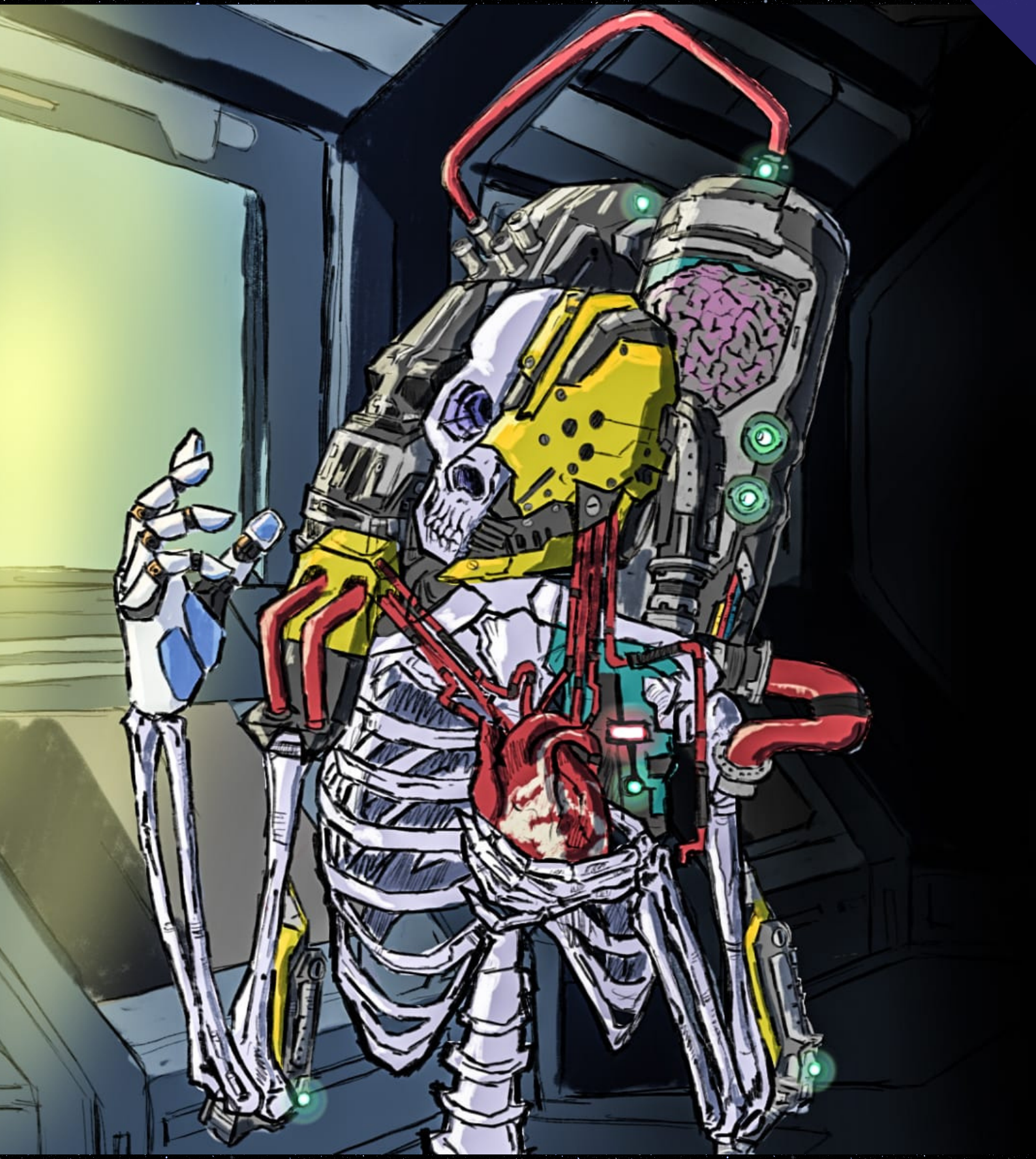

THEORY OF EVERYTHING MEDICINE

Insight

In the history of science, multiple experiments in the branch of physics have led to breakthroughs in the field of medical science. The Nobel Prize in Physiology and Medicine in 1979 was awarded jointly to physicist Allan M. Cormack and electrical engineer Godfrey N. Hounsfield for the development of computer-assisted tomography. And that's just one of the multiple ways physics has bettered the understanding of the human body. History has witnessed how augmentation in science has always required a congruence of all the fields of sciences.

Any aspect of human biology can be explained by the laws that govern physics. From childbirth to the mechanics of breathing, and the eventual state of equilibrium that defines death, it's all physics! Any corner of the hospital you turn your way to you are most likely to sight on the instrument- The stethoscope, which relies on the principle of acoustics. The existence of the department of radiology is based on man's understanding of electromagnetic waves. The concepts of physics have not been limited to diagnosis anymore, today they've made their way to treatment and management as well.

This is why with this edition we chose to redefine our understanding of physics and what it means to the field of medicine.

The word physics literally translates to knowledge of nature. Exactly 50 years ago, in a speech entitled "A physicist looks at biology", Max Delbruck, a leading physicist who had made a conversion to biology some years earlier, attempted to describe the transition. In his speech, he spoke about the absence of 'absolute phenomena'. Given that he had been reared in different atmospheres, his ultimate goal to achieve a radical physical explanation for biological systems aligns with the future of modern medicine.

Keep Reading, Keep Experimenting!

- Unnati Shukla & Khushboo Doshi, Co-Editors

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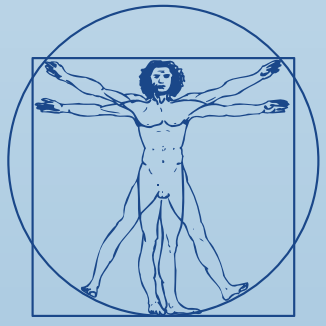
by Atharva Pawar & Khushboo Doshi, II M.B.B.S.
M.I.M.E.R. Medical College, Pune



Most of us might know Leonardo da Vinci as the renaissance generalist who created the best known, the most visited, the most written about, the most sung about, the most parodied work of art in the world, The Mona Lisa. Some of us might know him as a polymath for his contributions in physics and engineering, but very few people know about Leonardo da Vinci's curiosity for human anatomy. His endeavours were way ahead of his time. He was a person who studied science to apply it in his art. He studied the physics behind the light to learn the concept of shadows and other interplays of lights, making his paintings look life-like. He studied chemistry to know which paints to be used for his artworks. Similarly, he researched and studied anatomy to draw the human body perfectly which was illustrated through The Vitruvius Man.

Over the course of his curiosity, he filled thousands of notebook pages with sketches and writing, his reference being dissecting human corpses by himself. Some of them are written in mirror writing and some are difficult to interpret. Although they were discovered much later, they gave significant insight into the internal structures of the human body. He was the first to produce the accurate depiction of the human spine, the first to state that the heart is a four-chambered structure and not two-chambered and also considered the first to correctly depict the human fetus in its proper position within the womb. His understanding of the movement of muscles in the human body led to the design and construction of the first-ever humanoid robot - the Robotic Knight.

In 2017, a video went viral showing a robotic surgery being performed on a grape. The robot, which is now clinically used for minimally invasive surgical procedures, is named da Vinci Surgical System by its manufacturer, Intuitive Surgical because Leonardo da Vinci's study of human anatomy eventually led to the design of the first known robot in history.

Martin Clayton, head of prints and drawings in the Royal Collection, aptly accounts da Vinci's legend when he says, "There were lots of investigative anatomists around at the time, and there were lots of artists who were interested in anatomy. But Leonardo pushed these two things further than anybody else. He was the supreme example of an anatomist who could also draw, or of an artist who was also a very skilled dissector. It was the union of these two skills in a single figure that made Leonardo unique."

A SERENDIPITOUS STINT IN NUCLEAR MEDICINE

by Dr. Oshin Behl, Dr. Med. Candidate, Uniklinikum Dresden & President, GCMER

When I applied for the ISCOMS research fellowship (IRF), I stuck to my research topic and applied for pharmacology. Excited and wide-eyed, I sat in the conference room of the University Medical Centre Groningen on the first day of the IRF. As students got called to go meet their mentors, I sat wondering what this pharmacology mentor would be like. To my surprise, I was called to the Nuclear Medicine department to meet Professor Boersma. Truly, I had no idea what the field was even about. Did they work with patients of radiation injury? Did they make drugs for them? As I looked at all the research posters of radiology, cardiology, nephrology and neurology in his room, I was intrigued. Nuclear medicine seemed to be ubiquitous, achieving what other drugs couldn't achieve in these diverse branches of medicine. The field of nuclear medicine combines physics, chemistry and mathematics with medicine, to detect changes in soft-tissue function, which standard X-rays simply pass through.

Radionuclides, the radioactive substance used in the scans for diagnosis, can be technetium, thallium, gallium, iodine, and xenon. These isotopes can act independently and be taken up in varying amounts by "hot spots" and "cold spots", or be labelled onto drugs to detect the bio-uptake of the drug itself.

Technetium-99 (99m-Tc), one of the most diverse radioisotopes, became my best friend for the next two weeks of my IRF. I studied how 99m-Tc could be used to detect the specific areas of cell death in myocardial infarction, which, to my shock, I never heard about even in my cardiology lectures, except maybe a fleeting glimpse. With my professor and Dr Jagat Narula, a rockstar in the world of cardiology, I worked on how we could use 99m-Tc in the detection of atherosclerotic plaques and their volatility, to further assess the risk of embolism. But well, that's a story for another PubMed paper.

Nuclear medicine is equally fascinating and daunting for medical students and doctors alike. It's a field begging for exploration of the endless diagnostic capabilities it holds. I wish we dove deeper into nuclear medicine in our pharmacological studies, beyond the Gallium scans for brain vessels. What medical students can do to change this is read a few of the research papers on nuclear medicine out there, and put our brains together to come up with more.

Mental Operations

GUEST INTERVIEW

Dr. Milind Deogaonkar, MD, PhD

In conversation with Khushboo Doshi & Unnati Shukla
II M.B.B.S., M.I.M.E.R. Medical College, Pune

Dr Milind Deogaonkar at The Joint Meeting of the Asian Australasian Congress of Neurological Surgeons (AASNS), 68th Annual Conference of The Neurological Society of India (NSI) and the International Meningioma Society (IMS) Congress, AANSIM 2019

Dr Milind Deogaonkar, MD is a Neurosurgery Specialist in Columbus, Ohio and has over 34 years of experience in the medical field. Dr Deogaonkar completed his MBBS and MS in neurosurgery from Government Medical College, Nagpur and proceeded to do MCh in neurosurgery from Seth G.S. Medical College and KEM Hospital, Bombay. He won the 'Anandibai Joshi National Award' for best young achiever physician from IRDS Lucknow, India. He has various patents like Apparatus for renal neuromodulation via an implantable device and Implantable electrode assembly for positioning target site and treating pulmonary conditions like asthma.

Q. The extensive training period in the field of neurosurgery takes about 15 years, which is a substantial amount of years. So in retrospect, how rewarding is the degree?

This concept of limited training is bizarre. As long as you are curious, the training won't stop. It is more of a journey than a destination. The best part of this field is that you can complete other aspects of your life while studying. We tend to look for a perfect time to settle in life, but in my opinion humans never really settle down. Given that we are revolving around the sun at the speed of 1000 miles per second so you are always moving, your training is just as dynamic and permanent.

Q. Given your immense experience when it comes to research, how much did your UG training contribute to the same?

In my opinion, there is a severe lack of research-oriented training in India. There are no substantial research projects conducted by students in their UG days. On the contrary, students in the states enter medical school after completing their B.Sc, so they are familiarised with the techniques beforehand. I myself got involved in research after my neurosurgery where I was working on small animal models to study about temporary MC occlusion in stroke perfusion reperfusion injury.

Back then I had no idea about how to handle animals, the amount of care that is put in, the ethical considerations and a lot of things. So I feel there should be a rotation during our training to teach us the ins and outs of research because eventually, research is your way of learning and improving. I remember the time when I wanted to learn more about functional surgery and I signed up for research in the same, during which I spent a few days learning how to handle a pipette properly. This clearly shows how to research opportunities and training is a dire need in our education system but apart from that, the research attitude needs to be inculcated. Every individual should ponder upon their how's and why's to be able to stay curious enough. Besides this, conducting ethical research is necessary for your work to gain credibility and respect. One shouldn't conduct research to prove themselves, instead, the target should be to answer that very question that made you think about conducting the research. Since you are very likely to get results that negate your primary hypothesis but that is how you get closer to the correct answer.

Q. What about neurosurgery piqued your interest and how did you manage to pursue it?

I didn't want to do MBBS in the first place, but once I got in I was quite curious about all the subjects. The thing about me is that I get bored very easily, which itself was the driving force in my career. So after MBBS I was interested in research and was considering pursuing a PhD from Cambridge. Eventually, I realised that treating patients gives me a lot of joy, so I got fixated on surgery. During my time in GMC Nagpur as a surgical resident, I performed a lot of surgeries and explored a number of avenues. After a year or so things started to get easy which made room for boredom in my life. Back in GMC Nagpur, there was one surgeon who would perform burr hole surgeries, which intrigued me a lot. Since neurosurgery was one of the least understood branches I was attracted to it, so I flew to England to study neurosurgery. Then again after a while aneurysms and tumours got too easy and boring so I explored epilepsy surgery in Newcastle for a while. At that time functional surgery was an emerging field, I liked not being limited by the anatomy of the brain and guiding my treatment based on the pathology of the disease as well as the physiology of the brain to change the output rather than altering the structure. Hence, I have ended up where I am out of boredom.

Q. How has the ongoing pandemic scenario changed or affected your form of practice?

While I was in the states, my routine practice pretty much stopped due to the pandemic.

I generally perform DBS for Parkinson's patients or spinal cord stimulation for chronic pain management which are elective surgeries and the patients are generally old and living with the disease for a long period of time, so there was no urgency. So I became a part of the hospital COVID team which led me to research Stellate ganglion block in preventing COVID ARDS. Then in August 2020, I came back to India and since then I have been involved in COVID management instead of surgery. Now I run a small primary care hospital in Chitrakoot.

Q. India struggles with top-notch technology when it comes to specialised procedures, yet India's medical tourism is booming. Why do you think that is?

I think India is one of the best countries performing advanced surgeries. We have some brilliant doctors who are incredibly skilled. India sure does fall behind on the technological aspect but that isn't holding the procedures back. Instead, lack of original research and development when it comes to specialised fields is where India is struggling, which is the only scope of improvement left.
I think people come here because of the compulsions in their own country. Like in the USA if you don't have insurance you don't have treatment. Most medical tourism consists of elective and reconstructive procedures. Even in the UK one has to wait about 9 months for elective procedures. Such patients do come here and that's the thing in our country we're happy to be a service industry. We haven't developed a lot of new technologies but we've aced the art of providing services and that has helped us take over the world.

Q. Does advancement in technology in medicine holds an equal footing to providing good healthcare service?

Yes and No. Some places in India are at par with the western world when it comes to technology. It's extensive so of course, it can't be expected across the country in every little hospital. However, today technology and skills are merging. A general surgeon cannot do endoscopic cholecystectomy without the technology even though he may be great at open laparotomies. Most of the surgical skills of today's world are based on some kind of technology whether it's a robot like da Vinci or simpler things like endoscopes or cameras. Having said that, to be a good doctor you don't need technology. Moreover, even skills aren't of most importance. What you need eventually to be a good doctor are compassion and kindness.

Q. The theme of our current edition is Physics in Medicine, so how much do you think the field of sciences truly integrate when it comes to the practice of medicine?

When you sub specialises in any branch of science there's always an overlap. What I do in the OR is mostly physics, there's very little neurosurgery. I make a small incision, a burr hole and that's the surgical part. Beyond that things like monitoring brain activity, recording of action potentials, the spikes and bursts of the same are pure physics. Recording cannula also has physics to it, when it comes to implants and the wires it uses. I need to know what's impedance and what's resistance, the translation of one volt into milli amperes. In the brain especially there's a lot of physics since everything begins with the generation of an action potential.
If you go a step further and look at the movement of sodium and chloride ions you'd be looking at chemistry. While the calculation of charge density and field areas involves mathematics. So if you look at the fields that are seemingly separated at the high school level, they all tend to merge as you go higher up.

Q. What about your form of practice makes you stand out from your fellow neurosurgeons?

I do very specialised procedures. I wouldn't call it standing out since I do the same procedures multiple times over. When it comes to your medical career, it has to be like a pyramid. You start with a broad base of clinical medicine, you go on narrowing it down to your speciality and further super speciality. Then you reach a disease you could develop an expertise in. Theodore Kocher was the first surgeon to get a Nobel prize. He did so for his research on thyroid where he eventually reached years after narrowing it down. When you create a niche for yourself you become indispensable. This is why I don't think it's standing out as much as it is just taking a different path.

Q. What are your views about the storm of litigation hitting hospitals in the states?

I think it's necessary. One needs to be accountable. Nothing can be justified by saying it's a noble profession and it's okay for mistakes to happen. In medicine one needs to be right 100% of the time and since that's not humanly possible one should be sincere enough to put effort or take ownership for their shortcomings. Perfection isn't possible but as long as you keep the patients and relatives within the loop of what's going on you wouldn't have to worry about lawsuits. You treat a patient in good faith, talk to the relatives, and write everything down in your notes and you never have to worry about lawsuits. This stands true in any country you choose to practise in.

Q. Neurosurgery has the maximum burnout rate of 50% as compared to other medical specialities. How do you manage to keep going and work every day?

Neurosurgery does have a lot of burnout rates. You watch patients not do well, the long hours, the stress of surgery it all takes a toll. I personally hate working in big hospital settings now and everything that comes with corporate hospitals but I still love surgery and that's why I keep going. But yes back in the USA, my neurosurgery residents undergo physician burnout assessment every month to find out any signs of burnout and if there's any found there are always remedial measures.

Q. What advice would you offer to an aspiring neurosurgeon given that your field has a long duration of the training?

One goes into medicine for only two reasons, service and science. I believe no other reason justifies going into medicine, since there are much better professions out there. And science always comes second to service.

As long as one goes into medicine with those ideas you would never be disappointed. As far as neurosurgeons are concerned, there's only one thing to do and that is to train. I wouldn't suggest one to go into a speciality that is in its peak, but instead to think about something that hasn't evolved yet. When I started doing functional neurosurgery very few people did it. I was teased for being a 'woodpecker' neurosurgeon, operating through small holes but it was a field still evolving then. When you're one of the early ones to do something, you get the joy of doing something new. The flip side to this is that working in Chitrakoot also gives me immense pleasure. People who don't have much come to me for diagnosis and treatment which I am so happy to do. These patients go home with medicines, come back after 8 days, happy. They're just glad they were given the time and attention they needed. That's another way to go about it. It will always be up to you to choose your path.

Comic strip by Atharva Rane, II MBBS, M.I.M.E.R. Medical College

ENGINEERING MEDICINE

by Pamposh Bazaz, III M.B.B.S., R.I.M.S. Raichur

The emergence of lifesaving biomedical implant insertion has today become a very common and often lifesaving procedure. The sheer volume of orthopaedic implants, hip replacement, knee replacement surgeries performed on a daily basis as well as the now widespread use of cosmetic implants has given rise to a newfound problem, implant-associated infections. In the quest to create anti-infective biomaterials, the focus tends to be quite one dimensional, preparing biomaterials with antibacterial properties and enhancing their properties by excess use of antibacterial agents. This extensive use has resulted in individuals with implants having compromised host responses and unpredictable effectiveness in vivo.

Thus, a more innovative means to resolve this issue has been deemed necessary. Two 4th year engineering students, Vishwas Mehta and Harshil Parekh, from Vellore Institute of Technology, Vellore, have come up with an ingenious solution: Using Reverse Micro Electrical Discharge Machining (R-MEDM) as a tool to fabricate arrayed structures for surface texturing, their project hopes to develop biomedical implants with enhanced bactericidal properties without trading off the patient's immune system. The study also explores the feasibility of the technology using Response Surface Methodology (RSM) and the influence of control variables such as material removal rate and surface roughness in response to changing current, voltage and pulse duration. This is analysed using ANOVA.

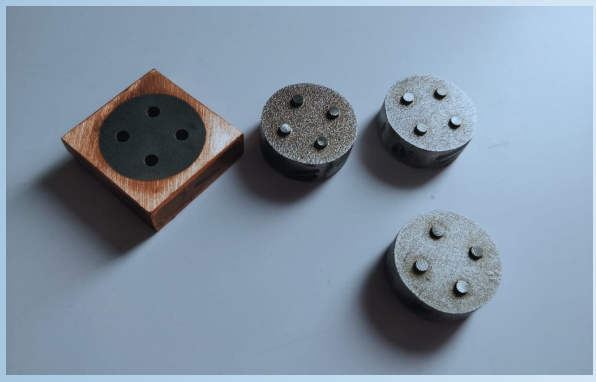
The project endeavours to investigate whether the fabrication of the microstructure surface produces significant antibacterial properties and hence its viability in biomedical implants. Biomedical implants have an increased risk of bacterial infection post-surgery possibly due to a polysaccharide matrix known as biofilm that attaches to the post-surgery surface of the implant and protects bacteria from pharmacological therapy.

Studies postulate that the walls of the bacteria disfigure while stretching as they interact with the textured surfaces. This stretching occurs in the particular areas between the structures and is sufficient enough to rupture the cell.

Nano and micro-structures impact the surface topography and roughness, drastically increasing contact adhesion area, hence ameliorating the bactericidal properties in comparison to flat surfaces. Parameters affecting the pharmacological bactericidal efficiency such as the height, radius and spacing between the micropillars are taken into consideration while producing the desired textured surface.

Earlier this year, Vishwas and Harshil were successful in implementing R-MEDM to alter the surface texture via the fabrication of micro-pillars on stainless steel 304. Control variables such as material removal rate (MRR), electrode wear ratio (EWR) and surface roughness (SR) showed maximum response to high current and voltage, the current being the most significant factor to generate a response.

Unfortunately, at present surface roughness is observed to deteriorate at very high values of voltage and current and doesn't meet the standard required to be of application in biomedical implants. Yet it also provides substantial evidence to conduct further research in the application of R-MEDM to develop advanced biomedical implants without compromising the health of patients thus ensuring that individuals with lifesaving implants don't succumb to diseases that are a result of the said implants in the future.



R-MEDM altered surface.

The HBO-T what?

by Dr. Dinesh Raja Muthalalichamy
Intern, Grant Medical College, Mumbai

Once you don the cap of an intern, after just a month of running hitherto around the hospital, you automatically become eligible to be a guide for your campus. You talk to people you have never heard of; you visit places you have never seen, and one such place for me was the Hyperbaric Oxygen Therapy (HBOT) chamber!
Hold on to your seats, let's go on a fun ride to learn about the reel world of abundant oxygen when there's paucity in the real one. In simple words, Hyperbaric oxygen therapy involves breathing pure oxygen in a pressurized environment.

Why should you care?
If your patient or a family member indicates this, this will make them healthier faster.

Who's Who?
The credits go to one imaginative American anaesthetist, Orville Cunningham, who famously built the 'Steel ball hospital' and used pure oxygen to successfully treat patients dying from the flu. In the 1920s, Dr Orville J. Cunningham was the leading exponent of hyperbaric therapy. An industrial tycoon, H. H. Timken, heard about this work and gave Cunningham $1,000,000 to build what ended up being the largest hyperbaric chamber ever constructed.

How does it work?
In a hyperbaric oxygen therapy chamber, the air pressure is increased two to three times higher than normal air pressure. Under these conditions, your lungs can gather much more oxygen than would be possible breathing pure oxygen at normal air pressure. This therapy provides you with air that contains 100 per cent oxygen.

What's the medical basis here?
When your blood carries this extra oxygen throughout your body, this helps fight bacteria and stimulate the release of substances called growth factors and stem cells, which promote healing. Your body's tissues need an adequate supply of oxygen to function. When tissue is injured, it requires even more oxygen to survive.

HBOT prevents "reperfusion injury."
That's the severe tissue damage that happens when the blood supply returns to the tissues after they have been deprived of oxygen. HBOT encourages the formation of new collagen and new skin cells.

Under what conditions can it be used?
Decompression sickness, potential risk of scuba diving, Brain abscess, Carbon monoxide poisoning, Burns, Severe Anemia, Gangrene, Crush injuries, Diabetic wounds that are not healing properly.

What are its types?
a. Monoplace chamber- This is a chamber built for one person.
b. Multiplace chamber- This chamber, or room, can fit two or more people at once.

HBOT is generally safe but has some potential risks, such as,

- Middle ear injuries, including leaking fluid and eardrum rupture, due to changes in air pressure
- Temporary nearsightedness (myopia) caused by temporary eye lens changes
- Lung collapse caused by air pressure changes (barotrauma)
- Seizures as a result of too much oxygen (oxygen toxicity) in your central nervous system
- Claustrophobia.

COSMETIC IMPLANTS

by Dr. Shivani Desai
Alumnus, M.I.M.E.R. Medical College, Pune

"It's not the wound that teaches, but the healing." -Marty Rubin

In the current world where Snapchat streaks and Instagram likes to decide one's authenticity, our phones tend to get flooded with images of the extreme waist to hip ratios, perfect pouty lips and hourglass torsos; labelling this constellation as the so-called "flawless figure".
Naturally, under this influence a lot of people have embarked on a quest to achieve this superfluous goal, putting aside their perfectly imperfect, beautiful selves. Just like two sides of the same coin, cosmetic implants are both boon and bane.
From securing a new life for various accident victims to getting dangerous side effects by the overdoing of cosmetic procedures, it is a double-edged sword that should be handled carefully. On the plus side, as reshaping, resizing and enhancing various body parts as per your will has become possible by these implants and procedures, people have regained their lost confidence, not to mention revived the functioning of a particular body part. When used correctly, cosmetic implants can really prove to be an asset. But there is a dire need to know the aesthetics and safety of any sort of cosmetic implants and procedures before tampering with your unique originality. No matter how alluring the outcome may seem, it is equally important to consider the downside of such aggressive silicone inserts.
Another crucial course of action is taking into consideration the side effects of the same, such as infection at the site of implant, prolonged scarring, shifted implants, allergies to implants, fat embolism, fat necrosis, nerve damage, complications of anaesthesia.
New terminologies like 'Breast Implant Illness', a foreign body reaction by our immune system has surfaced which has made this postmodern veil all the more precarious and iffy. There's power in choosing health over vanity.
Not falling for the trap of social delusion and instead choosing what your body needs best to relish greater satisfaction as well as genuine improvements in your body image after the procedures, is something that should be the prime rationale.

AI vs Physicians

by Zoya Mhaisale, I M.B.B.S., M.I.M.E.R. Medical College,Pune

"AI is one of the most important things humanity is working on. I think of it as more profound than electricity or fire."-Sundar Pichai

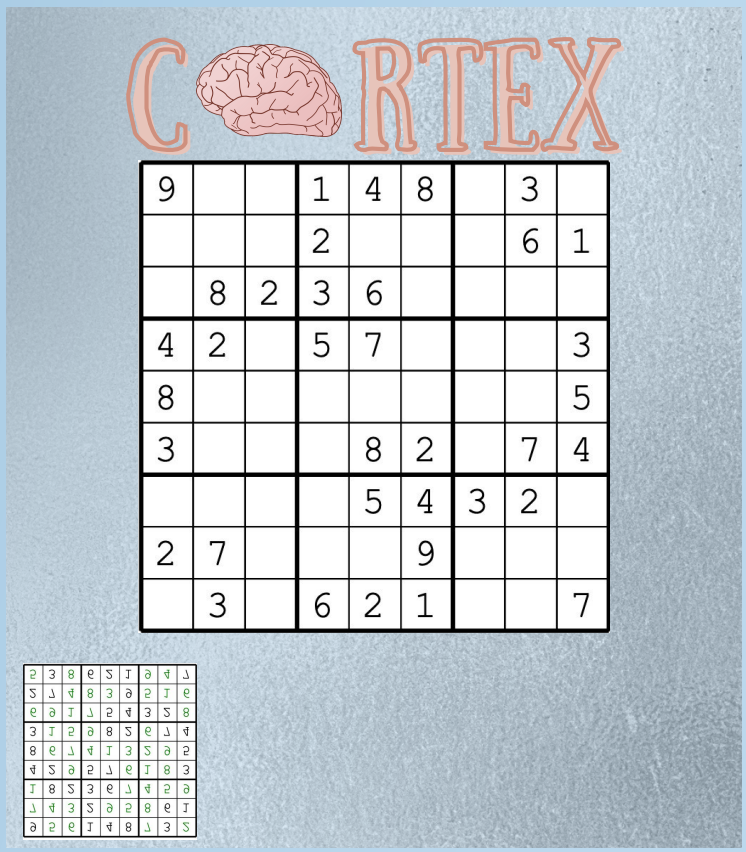
Artificial Intelligence (AI) was first recognised in the 1940s and since then its growth has been difficult to keep up with. The field of medicine is no exception. The dominance of AI-based methods and technologies is increasing exponentially, maybe to even replace physicians. IBM's Watson now diagnoses heart diseases better than cardiologists do and algorithms identify eye diseases just as well as specialized physicians. In a few years, AI is bound to completely replace radiologists in inspecting medical imaging. AI is poised to play an increasingly prominent role in medicine and healthcare because of advances in computing power, learning algorithms, and the availability of huge amounts of data sourced from medical records and health monitors. Using machine learning, AI evaluates an enormous amount of data to make accurate predictions and to recommend interventions. The innovation in IT procedures enables you to create a cost-effective analysis of huge databases including claims, health records and medical imaging reports.

Artificial intelligence-based solutions will eliminate the need for human labour and will replace human resources in medical jobs other than the actual patient-doctor interaction such as administration, charting and disinfecting hospital spaces thereby offering telemedicine solutions. A 'human' doctor cannot treat millions of patients across his/her lifetime but for 'robot' doctors, that's possible.

Now the debate is whether robots can replace flesh-and-blood clinicians in the future by providing a better medical diagnosis or medical therapies. This seems like a reality considering the spiralling cost of healthcare and the scarcity of healthcare workers but such a stance fails to realize the need for the human touch. Don't you want your doctor to hold your hand while discussing your cancer diagnosis? That's where human doctors are irreplaceable as empathy or human connection is critical in such life-changing moments or discussing the life-threatening treatment plans to cut down the risk of dragging your patients into trauma. AI can enhance clinical productivity due to its ability to handle a large capacity of tasks that are well suited for automation and can reduce the burden of clerical work thus improving the quality of care and allowing doctors to spend more time with patients. No robot or algorithm at present can interpret complex, multi-layered challenges - involving the psyche. While they will provide the data, interpretation will always remain a human territory. With AI, there is a lack of human sensitivity that still requires human expertise in the interpretation of data and recommendations. A study by the New York University found out that when health care was provided by AI rather than by a human care provider, patients were less likely to utilize the service and wanted to pay less for it They also preferred having a human provider perform the service even if that meant a greater risk of an inaccurate diagnosis or a surgical complication.

The reason is not the belief that AI provides inferior care or is more costly, less convenient, or less informative. Rather, this resistance seems to stem from a belief that AI does not take into account one's idiosyncratic characteristics and circumstances. People consider themselves to be unique, and this belief includes their health, but this apprehension should not overcome the possibility of providing better healthcare through collaboration between technology and medicine. To provide the best of healthcare, medicine needs technology for better efficiency and greater accuracy. We must try to address this hesitancy by making an effort to assuage concerns about being treated as just a statistic. This includes taking actions that increase the perceived personalization of the care delivered by AI. Having a physician confirm the recommendation of an AI provider can make people more receptive to AI-based care. Exclusively AI-based services could also include cues like "based on your unique profile" that suggest personalization of patient information.

AI vs physicians is not a war nor a race to prove which one can replace the other and dominate the healthcare system in the future. Imagining healthcare without physicians is not possible and AI is a powerful tool that can help us improve the healthcare system by leaps and bounds - something humans desperately need right now.



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Shutterbug

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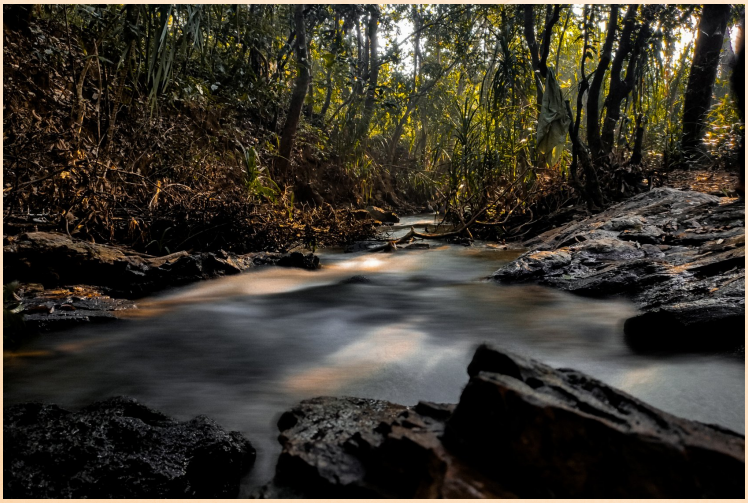

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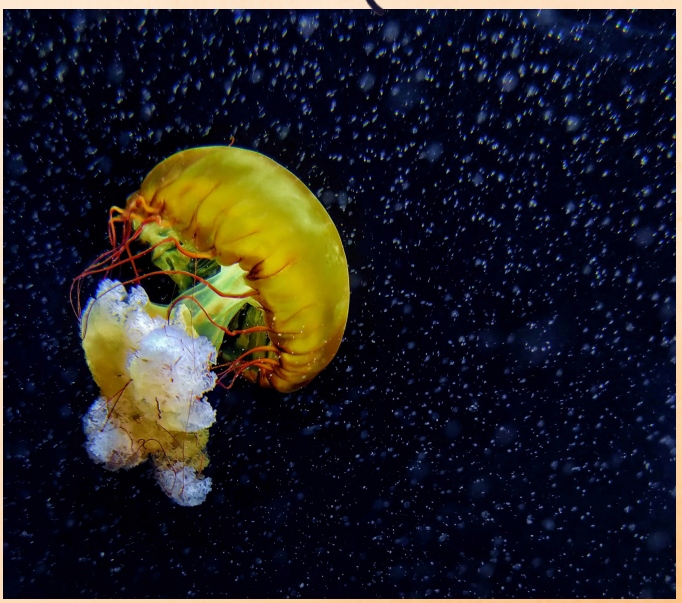

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ROBOTIC SURGERIES

by Isha Kulkarni, II M.B.B.S.,
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Surgery has traditionally been a speciality within the medical profession that has revolved around invasive procedures to treat various maladies that can't be managed with chemotherapy. Earlier, trauma induced by the surgical procedures as necessary to provide benefit to the patient. But today, through the advent of digital imaging technology, combined with optical engineering and improved video displays, surgeons can operate inside of body cavities without the larger incisions previously deemed essential for surgeries to be successful. Minimally invasive surgeries make it possible to reduce or eliminate the "collateral damage" previously required to gain access to the organ being operated upon.

While performing robot-assisted operations, surgeons make tiny incisions in your body and insert miniaturized instruments with a high-definition 3-D camera. A basic surgical robotic system consists of three components - the surgeon's console, a patient cart, and the vision cart. All of these components work together. The surgeon seated at the console overlooks the entire procedure. The surgeon has the master control over the instruments' movement and actions. The patient cart holds the camera and the instruments that are required for the surgery. The vision cart is the third component that enables seamless communication between all the components.

The components of different surgical systems may vary depending on the particular system. For patients, this allows the surgical procedures to be done with precision that was never possible before. This is why robotic surgery is great for delicate surgeries as well. Surgeon fatigue is minimized during robotic surgery as they can sit comfortably and use their hands to guide the movements. Robot hands have a greater range of motion and dexterity than human hands. Combining that with a highly magnified, high-resolution image of the operating field, the surgeon in charge has better access to the area being operated on, guaranteeing a higher success rate. Robotic surgery's efficiency means shorter duration required for recovery ensuring patients get back to work much faster. Since the surgery is minimally invasive, there is little to no collateral damage and postoperative scarring. It is comparatively less painful and the risk of infection is much lesser.

Innovative procedures such as Telesurgery and haptic gloves are now being extensively used across the world especially in the west. Telesurgery's first demonstration took place in 2001 when surgeons in New York operated on a 68 - year old woman in Strasbourg, France.

It further gained its importance in the COVID-19 pandemic. With the advancement in faster communication networks, regular use of telesurgery could be a reality in the future and potentially allow delivery of the best possible care to anyone in the world, irrespective of geographic location.

Haptic gloves: with robotic surgery, the surgeon relies only on the vision to operate, the feel of the tissues is of significant importance in the case of large, advanced tumours. Ongoing research on developing pressure and tactile sensors to simulate the tissue will be something to look out for. To conclude, although still in its infancy, robotic surgery has already proven to be of great value, particularly for inaccessible areas. Robotic technology is set to revolutionize the field of surgery by improving and expanding laparoscopic procedures, advancing present-day technology, and bringing surgery into the digital age. And with every incision we make, we dive into the vast untapped potential that the field presents.

COMPLICATIONS

A surgeon's notes on imperfect science

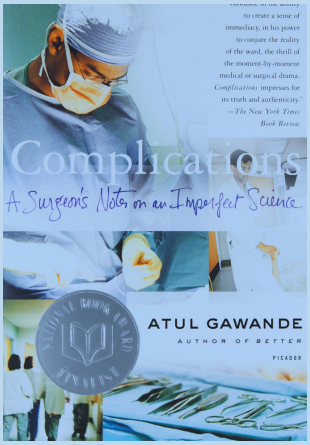
—BY ATUL GAWANDE

Book Review by Parikshit Sen, II M.B.B.S.
Maulana Azad Medical College, New Delhi

"We have taken it to be both more perfect than it is and less extraordinary than it can be."

'Complications' begins with a bullet wound in a young man's buttock and ends with a woman whose leg is nearly destroyed by horrific flesh-eating bacteria. Written during his general surgery residency, Gawande takes us through a gripping account of true cases, exploring how an act of calculated and precise violence saves lives. He offers, in unsparing and thrilling detail, an immersion into the operation theatre, an unflinching view from a scalpel's edge of the split-second decisions that could mean life or death and the limits, often unsuspected by patients of doctors and medicine. However, what this beautiful collection of essays is not is a casebook. You will not find dreary abbreviated descriptions neatly demarcated into sections. No, you will be right there with the author as he makes his first incision, feeling the heady brew of the spine-tingling exhilaration of slicing open a patient for the first time, the anxiety of getting it right, and the halting uncertainty as if it were your own.

The book is unrelenting, often overwhelming from the surgeon who left a large metal instrument in a patient's abdomen, where it tore through the bowel and the bladder wall to when Gawande diagnoses a horrific infection based on a chance biopsy. You would be left both terrified and humbled by the poignant realisation of how fundamentally human an endeavour medical science is.



Though doctors' mistakes can be terrifying, there is a comforting reassurance that the person holding the blade, as you lie unconscious, is a person you've talked to the day before, guided by the faith that what they were doing was good for you.

So go ahead, pick up Complications and get absorbed in this perfect book that explores just how extraordinary and imperfect science can be.

Lights, Camera, Prescription.

by Archana Ponnuswamy, II M.B.B.S., Vedanta Institute of Medical Sciences

CHICAGO MED

Chicago Med may not be quite as saucy and provocative as we've seen in medical shows such as Grey's Anatomy (a series that has outlived most of its patients by now).
The ER can be a bloody, gruesome place, and the camera spares little when it comes to showing us people's injuries as well as giving us a front-row seat for wince-inducing surgical procedures. To top it off, the show also deals with tough, real-world issues, such as rape, assisted suicide, schizophrenia and drug use. Hopefully, Chicago Med will continue to stand on its own and will find a way to distinguish itself from other hospital dramas in the future.

THE GOOD DOCTOR

The Good Doctor is a show that describes the journey of a person with an autistic disorder, who completes his medical studies but suffers to seek acceptance from his peers who time and again doubt his incredible abilities. The Good Doctor is the kind of medical drama that finally has created a voice for medical doctors that deal with the gift and struggle of autism. The medical drama series shows how people on the Autism spectrum think uniquely and preciously! This show has given people a lot of hope as someone with high-functioning autism. Dr Shaun Murphy is someone who is a very special voice in creating visibility for medical doctors with disabilities. The series educates people and those that are in the medical world about the special gift and struggle of Autism. It is a television series focusing on the intersectionality between disability and profession.

NEW AMSTERDAM

New Amsterdam reflects real professional and personal relationships in the workplace. Truthful viewing of how relationships begin, developing a professional friendship in the workplace, different personalities within the Medical Staff without reflecting negatively on their medical ability, Staff that is focused on healing, research and studying, Medical Staff with excellent bedside manners allowing the patient to clearly comprehend what is being conveyed. The show depicts the human side of doctors in the midst of their everyday struggle in treating patients, to heal them and give them the best quality of life, how they share the joy of successful surgeries and treatments and the frustrations of illnesses that are way beyond our control. The writing is strong, albeit a bit corny at times, and the show is truly socially conscious, doing a great job highlighting hot button social issues and the flaws in our healthcare system which prevent so many from accessing affordable and life-saving healthcare.

Tea Table Talk

Mr. Sachin Machindranath Bengale, Canteen Staff

In conversation with Gauri Hirekerur, I M.B.B.S.,
M.I.M.E.R. Medical College, Pune

Mr Sachin Bengale works in the canteen of MIMER Medical College, since five years His favourite part of the day includes mingling with everyone he work with, as well as the doctors and students.

Q. Apart from cooking and serving countless people every day, what else are you interested in?
I do love making sure everybody is fed well and their needs are met, but apart from this, playing carrom has been a longtime hobby of mine. I try to play as much as I can as it is an escape from the hectic schedule for me.

Q. Most of the students and doctors are in a rush to have their food, considering their tight schedule. How do you manage all that?
We are now acquainted with all the breaks they have, the breakfast and lunch timings, their little snack time cravings. Since we have around half a dozen workers, we divide and distribute each section like serving, cooking, cleaning and reception. Although we only have one chef, we try our best to serve in the minimum time possible to avoid any inconvenience to the customer.

Q. It is needless to say you are a big part of students' lives. Over the years, what are some of the interesting things you've observed in them?
Every individual has a different personality. No doubt some unique groups come around, but we try not to intrude and give them the utmost privacy to lay back and relax. After all, customer satisfaction is what matters the most.

Q. Does playing music like you always do here help set up a pleasant work environment?
Definitely! It helps us indulge in our work. And isn't a serene environment beneficial in being more productive? But the main reason we turn on the music system is for the doctors and students to have a happy place. When they come in, we want them to be ridden of the stress of a tiring day. We also make it a point to at least give them a glass of water to start with.

Q. What would you like to say to all the students aspiring to become good doctors in the future?
Most people I come across are really cooperative. But sometimes, work problems and temper get the better of them. Occasionally this frustration is unleashed on us. So I would like to request them to control their anger and abide by the timings of the canteen. Our foremost priority is to provide a service that ensures peace and calm. So try to enforce empathy in what you do and be a little understanding. Stay happy and stay safe!

DIALOGUE

DR. SACHIN NAIK, DEPARTMENT OF SURGERY, M.I.M.E.R. MEDICAL COLLEGE, PUNE

In conversation with Nupur Chaturvedi III M.B.B.S. & Neel Waghu I M.B.B.S. , M.I.M.E.R. Medical College, Pune

Dr. Naik completed his M.B.B.S. and M.S. (General Surgery) from Nagpur. He went on to become a laparoscopic surgeon and has worked under Dr. Nageshwar Reddy and Dr. C. Palanivelu who are amongst the most eminent gastrosurgeons in our country. He is one of the most knowledgeable yet humble doctors we have and is an inspiration to all his students.

Q. From hospital visits to lectures, your day is quite hectic. Could you describe your daily routine?

The word 'hectic' is associated with tasks that one doesn't enjoy doing. I believe that as long as you enjoy doing things at your workplace, you will never feel overburdened. As far as my routine is concerned, it varies every day depending on how I'm placed and what surgeries have been scheduled, but I'm very particular about my meal timings. I also make it a point to go to bed on time so that I can wake up fresh for the next day.

Q. Many students have a tough time during the counselling process for NEET-PG (i.e. confusion between M.D. and M.S.); What would be your advice to them?

My advice to all would be to first and foremost reflect upon your interests. It is of utmost importance to decide where your interest lies and which subject you are inclined towards. To be able to reach a conclusion, you need to weigh out the pros and cons of every speciality, the skillset that you require and how demanding every field is. Talking to peers, seniors, postgraduates and teachers will help you get clarity on the nitty-gritty of every subject. In the end, it all comes down to what you see yourself doing. One must always follow one's calling. Being a surgeon, I'd say that surgery is nothing less than art. If you have the knack for doing intricate things well, then you can take up surgery.
The dilemma between choosing preclinical and clinical subjects can also be resolved if you know your likes and dislikes well. I'd say that clinical subjects are for someone who looks forward to seeing patients every day and has the ability to make a connection with them.
Perspective plays a pivotal role as well. You will come across doctors who prefer a 9 to 5 job at the clinic and some who always want to be on their toes. This difference stems from the sheer perspective and it eventually comes down to how you want your life to be.

Q. Every day we hear about technological advancements being made in hospitals. Which of these new machines is being used in our hospital?

Here at our hospital, we are equipped with all the latest instruments and machines like electrosurgical devices, a camera monitoring systems, laparoscopes, endoscopes etc. While I was in med school, we didn't have all the high-end instruments that we do now. A cautery, for instance, was one device used in almost every surgery but it had its drawbacks too. As technology progressed with leaps and bounds, newer modifications of cautery, ligatures and harmonic scalpels were introduced which have made surgeries so much easier to perform.

Q. How was your time working under Dr Palanivelu, the pioneer of minimal access surgery in India?

My experience learning surgery under a surgeon as renowned as him was beyond what words can explain. The most fascinating thing about every doctor in that institute was their method of teaching postgraduates.
From the nurse teaching us how to wash instruments to surgeons teaching us how to hold a veress needle, every little thing had an SOP that had to be followed. It reminded me of Nana Patekar's wife from the movie 'Ab Tak Chhappan' and how she had a fixed recipe for her curry, not one spice less, not one more. Similarly, teachers in that institute from the junior-most to the senior-most had a fixed methodology of teaching. They believed that one task done repeatedly, in the same manner, would help you master it.

Q. While establishing your private practice you might have had to compromise on some of the state-of-art technologies. How was that transition like?

Technology and money go hand in hand. The newer advancements in our field require immense amount of money to be put in. The cost of laparoscopes, colonoscopes, duodenoscopes etc. has skyrocketed over these years which is one limitation for surgeons who wish to set up a private practice. In India, it is not the complexity of a device that limits a surgeon to explore new avenues, but the financial aspect of it that turns out to be the hurdle. The transition was difficult but every system has its own shortcomings.

Q. How important is physics for a surgeon? Can you describe a few methods based on its application?

Physics is the basis of all sciences. In surgery, obviously, physics plays a very big role. Any simple surgical instrument for that matter say an artery forceps- it's one of the simplest instruments and works on the principle of a lever. If the lever is slightly in the midline where the shaft becomes smaller and the jaws big, it is used as a forceps, but when the lever goes anteriorly and the jaw is stout, it becomes a needle holder. The newer advancements have pure physics like electrosurgical advances and technologies. You need not learn the physics behind it to a great extent, but technical expertise is definitely required.

Q. Sanitation and disinfection of the hospital wards would have been a major concern these past months. What special measures were taken by the surgery department for the same?

The entire hospital, you might have noticed, is kept very nice and clean. We had to appoint some external agencies to achieve this feat. Many patients and their relatives do say that this hospital gives a different radiance. It's not dirty like a general hospital. During COVID times, there was an extra load and a lot of consumables were being used. We had to manage with measures such as incineration. The regular methods which have been there for years have been used. Recently our hospital received the award for the best Covid Hospital of the year which speaks for itself.

Q. Right from first-year medical students read about surgical practices and methods through Applied Anatomy. What would be your approach to introduce surgery as a subject to newer students?

As I said, when you enter MBBS you are just happy that you got in. And then by the end when you come to the internship you're lost. You don't realise what your aim is. Again you start preparing for an entrance without any clue of what lies ahead. Hardly any students would be confident about securing a good rank on the first attempt and be clear about the course they want. So, many are like me who go with the flow and choose the course accordingly once the results are out and as things happen. So my advice would be not to get bogged down by the burden of expectations. Just enjoy your subjects. Try to learn different things. And as you continue through the course your preferences will become clear. The internship is where you actually get to see what happens in every department so you start getting an inclination towards a particular subject.

Q. Back in school, which was your favourite chapter in physics and which one did you dread the most? Does your daughter consider you a reliable source when it comes to her high school physics?

I dreaded the entire book. I never liked physics and maths. I'm just not good at visualising the questions and formulae. Somehow my daughter feels that I'm good at it.

Q. Many Students preparing for further studies are determined to pursue Surgery (MS). Apart from medical expertise, which other skills are required to excel as a surgeon?

I passed MCh with flying colours, consulted a few people and took neurosurgery. Started working in Sion but soon I realised that this wasn't my cup of tea. I resigned. Then I went on to pursue my career in GI surgery. Today I don't repent my decision. Every field has a vast area to learn, achieve and make yourself confident. I'd like to share my experience in surgery. We used to finish off our cases by 2 am. The only thing open at that time was a tea stall. We used to eat whatever was available at that time, sleep and then get ready for the next day. But everyone isn't cut out for such a lifestyle. It's important that you find your own interest and your own path. Things will fall in place so keep your cool. For a surgeon, perseverance is the key. You have to put in years of hard work to become a surgeon for which you require consistency in your work.
Secondly, you must live your life to the fullest. I wasn't born a surgeon. So I don't have to just perform surgeries the entire day. Many of my colleagues perform surgeries the entire day but this causes a rift in their personal and family life. That shouldn't happen. Maintain a balance and make sure that life doesn't get boring.

TAAZA KHABAR

by Angelin Jose, III M.B.B.S., R.I.M.S, Raichur

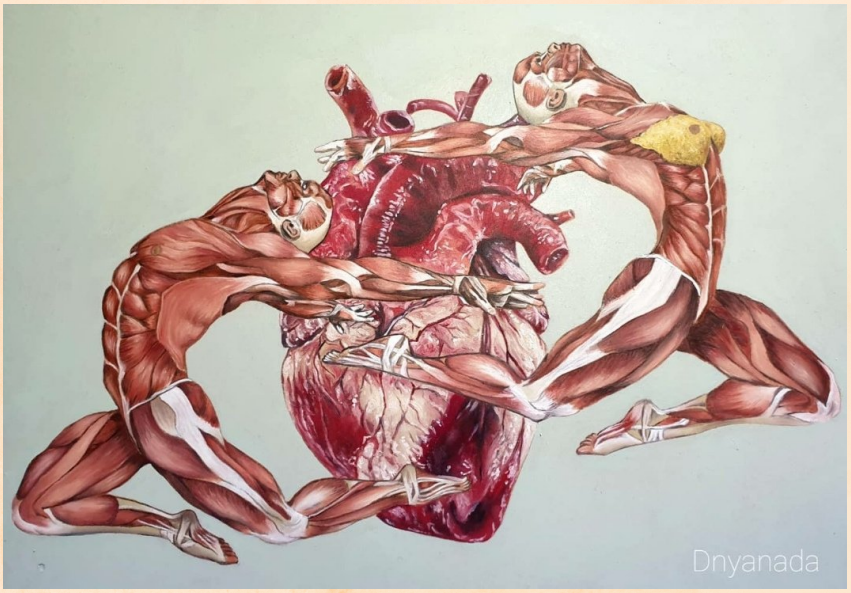
Graphene sensors for COVID

Fever, sore throat, dry cough, headache, shortness of breath. A small list of symptoms that are enough to send chills down one's spine. So, let's talk about the elephant in the room, COVID-19. Although vaccine drives are being practised across most of the nations, global immunity and disease control is still quite far away. Hence, this calls for comprehensive testing.
A group of researchers at the University of Illinois, Chicago have come up with a graphene-based sensor that can rapidly detect the SARS-CoV-2 virus. The electrochemical sensors consist of graphene sheets that are coupled with an antibody against the viral spiked protein. The viral particle, when in contact with the antibodies, binds to it, thereby, leading to a change in the vibrational properties of the graphene sheet and resulting in an increase in the output signal. According to researchers, the sensors also provide an indication of viral load, indicating the progression of the disease.
With a constantly changing pandemic at hand, better and accurate techniques for the detection of COVID and its variants is the need of the hour. And here come the graphene sensors that can 'de-burden' the whole process of testing. One of the greatest merits of this new tool of diagnosis is that the test only requires a maximum time of five minutes. This new technique is highly sensitive and selective for COVID, and at the same time quick and less expensive.

Pigment

Madhuraa Patil

II M.B.B.S., M.I.M.E.R. Medical College, Pune



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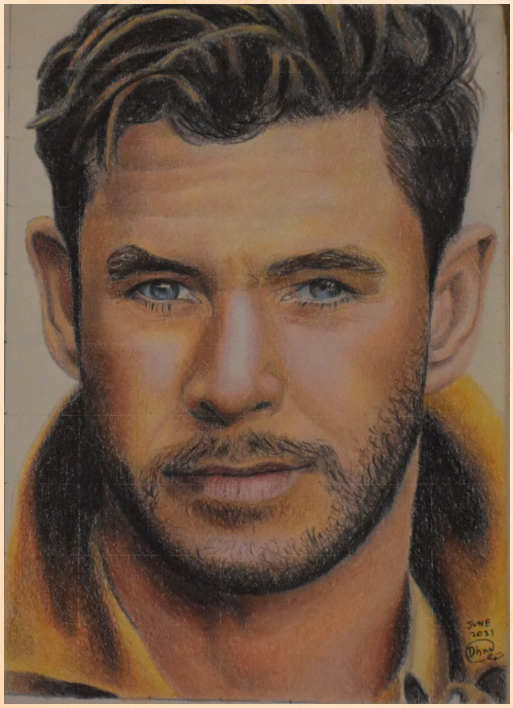
Intern, M.I.M.E.R. Medical College, Pune



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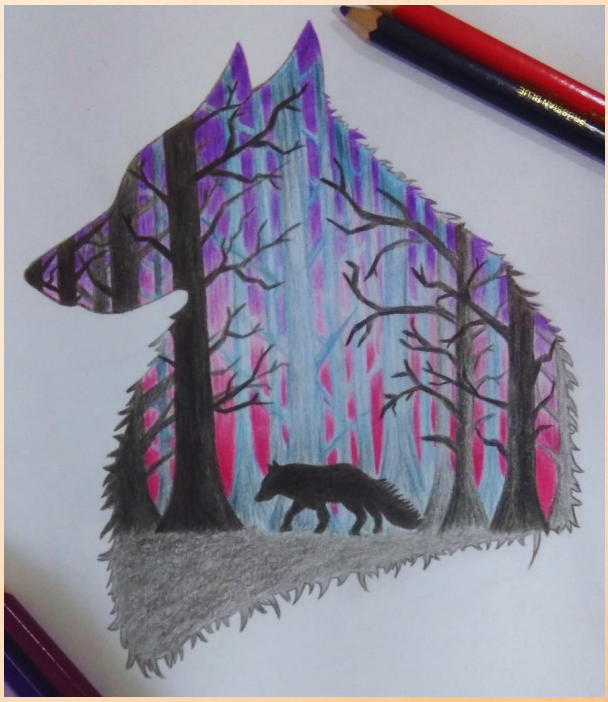

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