Journal of the Vivekananda Institute of Medical Sciences

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Peer review is the heart of scientific publication. The Editor wishes to place on record the contributions of the following VIMS Faculty who have provided their time for peer review of the submissions :

Dr. Ajitesh Roy (Assistant Professor, Dept. of Medicine)

Dr. Pranamita Ray (Associate Professor, Dept. of Pathology)

Dr. Debjani Sinha Ray (Assistant Professor, Dept. of Radiology)

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Editorial

Data Processing, Electronic Patient Records and Cyber Attacks

Dame Fiona Caldicott passed away from pancreatic cancer on 15th February 2021. She initially trained as a General Practitioner but then specialised in Psychiatry, later becoming President of the Royal College of Psychiatrists. She also became Principal of Somerville College, Oxford, Pro Vice Chancellor of Oxford University and Chair of the Oxford University Hospitals NHS Trust. However, she is a household name in the UK National Health Service for chairing, in 1996, a committee of experts that came up with what are known as the 'Caldicott Principles'.

In our modern world, data is money. Every online transaction we make and every link we click on generates a bit of data which helps companies not only track our whereabouts and spending habits, but also build a sometimes unnervingly accurate personal profile of us. Most of us do not choose to think about this – we happily give away our data in return for the convenience of conducting many of the tiresome tasks of everyday living using our smartphones, tablets or laptops.

The ability of computers to store and process large amounts of data and make it available in formats determined by the user quickly led to the digitalisation of health records. One of the cornerstones of clinical medicine is patient confidentiality – patients must be assured that the details of their health issues will not become public knowledge and will not be shared without their express consent. In 1996, concern about the potential for misuse of patient data in IT systems led the Chief Medical Officer of England to establish a 50 member committee of experts to look into how patient confidentiality could be maintained in Hospital IT systems across the UK. Dame Caldicott was appointed the committee Chair, and the six principles for handling patient data became known as the Caldicott Principles. In addition, the committee recommended that each NHS Trust should appoint a senior employee to act as the overall responsible officer for patient data confidentiality, and they are known as Caldicott Guardians.

Electronic Patient Records (EPR) are designed to have the complete medical history of each patient on file. At the click of a mouse the physician can access clinic attendances, test results, imaging studies and reports. They must be kept securely, with access granted only to those who really require it, by means of secure passwords that require regular change. Even though the UK has one National Health System, it has still been unable, notwithstanding an investment of over £1 billion, to create a uniform EPR system whereby a doctor in any hospital of the country may access the records of any particular patient. The challenge of implementing an EPR system in India, where every state has a different government healthcare set up in addition to the private healthcare providers, and any patient may consult several different specialists at any one time, is immense.

A new threat to IT systems everywhere, both commercial and private, is the cyber attack – the system being hacked, disabled, and a ransom demanded. On 17th May 2017 the WannaCry ransomware cryptoworm targeted computers

running Microsoft Windows, encrypting data and demanding ransom payments in the Bitcoin cryptocurrency. Several NHS organisations were affected, but the attack was quickly brought under control. However, for the duration of the attack, the affected hospitals were unable to access patient records, order tests, check results, schedule appointments – in effect they were brought to almost a complete standstill. Staff had to start using pen and paper again. As I write this, in June 2021, the Irish Healthcare System has been brought to a complete standstill by hackers.

Here at the Vivekananda Institute of Medical Sciences and Ramakrishna Mission Seva Pratishthan, we are still in the infancy of data processing. Although the finance department and patient billing has been computerised there is no ward computer network to allow easy access to patient information by the medical staff. On an individual level, surgical trainees (and staff) may consider the e-logbook maintained by the UK Royal Colleges of Surgery. This is a free to use, secure, encrypted facility accessible by mobile 'phone, laptop or desktop computer, covering all the surgical specialties. It is meant for life, and allows the surgeon to record not only the names of procedures, but also relevant steps and any complications. If you wish to know exactly how many cases of laparoscopic cholecystectomy you have performed over the last 10 years, the data is available within a minute, neatly classified in to those in which you were supervised and those performed independently. All entries are to be validated by the supervisor. For the non-surgical trainee there are various e portfolios available for the recording of clinical activity. As a training tool such logbooks are a useful way of assessing progression of competence, as long as they are accurate and regularly reviewed by the trainers. The West Bengal University of Health Sciences logbook, while a step in the right direction, is unfit for purpose in its current hand written form. A shift to an online model would be beneficial to all concerned.

Ranjan Raychowdhury, Executive Editor; Professor, Department of ENT & Head Neck Surgery, RKMSP, VIMS

Guest Editorial

Impact of Covid-19 in Sexual Reproductive And Health (SRH) Services in The Asia — Oceania Region

Krishnendu Gupta[1]

The COVID-19 pandemic has vastly affected the lives of all, especially those of women, both pregnant and non-pregnant, and their families. This unfortunate pandemic has also wreaked havoc on health systems, led to a global economic shutdown, and upended life as we know it. As the virus spreads at alarming rates, the fallout has spanned the globe and revealed the ill-preparedness of governments, health systems, and social safety networks to respond to the longstanding and emerging needs of people worldwide, especially relating to the health and rights of women and girls. While the global response has rightly focussed on containing the virus and treating the infected, it has also illustrated gaps in our existing approach to sexual and reproductive health (SRH) care and articulated the need to embrace a comprehensive approach to health care long after the crisis ends.[1] As of 24 November 2021, the number of persons infected worldwide has sky-rocketed to over 260 million, killing more than 5.18 million people, with cases still rising ona daily basis with the second wave of COVID infection having already swept in many parts of the world, and the third wave looming large in many countries, the Asian subcontinent in particular! The grim situation in India currently stands at 34.5+ million infections with over 4,67,000 deaths.

The important issues relevant to SRH care and services during the COVID-19 pandemic in the Asia & Oceania region were as follows :

- Lockdown measures in response to COVID-19 have closed schools around the world, leaving an estimated 1.54 billion young people out of school, even fewer young people are now receiving vital Comprehensive Sexuality Education (CSE).[2] All too often when shifting from offline to online learning, CSE falls by the wayside and is not included in learning packages. And even where it is, with connectivity still being a luxury rather than a right and an ever-widening digital gender gap, girls and young women from marginalised, poorer households are the least likely to be able to access this information. Even if they then overcome numerous barriers to get online, girls and young women are so often subject to harassment and abuse, they are less likely to stay online.
- Due to the lockdown leading to disruption of family planning andimmunization services, there is expected to be a huge burden of unintended pregnancies, and newborn and young children falling out of immunization programs, and its aftermath.[3]
- Girls and young women faced significant barriers in accessingessential sexual and reproductive health information and services before the COVID-19 crisis. Now, amid a pandemic that is straining even the most robust of healthcare systems, there is a real risk that these rights will move even further from reach.
- With lockdown leading to a shadow pandemic of gender-based violence – and rates of child marriage, teenage pregnancy and female genital mutilation (FGM) predicted to increase

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exponentially – information and services that protect and promote girls' and young women's sexual and reproductive health and rights are more vital than ever.

- In just a single year, a 10 percent decrease in sexual and reproductive health services in low-and middle-income countries could lead to another 49 million women with unmet need for contraception; another 15 million unintended pregnancies, another 28,000 maternal deaths and 1,68,000 newborn deaths due to untreated complications, and another 3 million unsafe abortions and 1,000 maternal deaths due to unsafe abortions.
- Consideration of extended use of some of the long-acting methods of contraception (if women unable to attend a clinic) such as the implants and hormonal IUDs as has been recommended in the UK.
- During the COVID-19 pandemic, using telehealth services has been strongly recommended by global and national peak bodies to increase timely access to early medical abortion for women, and increase access to sexual and reproductive health services.
- Awareness of the possibility for increased rates of domestic violence and its impact on women's sexual and reproductive rights. Citizens must be sensitised towards the increased risks of depression due to the prolonged lockdown resulting in lost income, unemployment and economic hardship leading to violent, abusive, impulsive, compulsive, and controlling behaviour and aggression directed towards cohabiting partners and romantic partners. It is also important that bystanders and neighbours should be urged to intervene if they suspect abuse, using tactics such as the banging on the door or ringing the bell. They should also be provided the benefit of anonymity if they choose to report a case. Reaching out to people facing domestic violence and in distress needs to be classified as an 'essential service' by the government.
- Impact on marginalized groups: consequences of the COVID-19 outbreak are felt most acutely by the elderly population and those already marginalized in society, including women and girls — particularly low-income and those in rural settings — LGBTQI individuals, people with disabilities, and indigenous people among others.[4]
- On-line webinars being conducted on a regular basis have helped members in the Asia - Oceania region to continue to provide safe and up to date measures for effective SRH services.
- There are several safe and effective vaccines that prevent people from getting seriously ill or dying from COVID-19.[5] Vaccines are a critical tool in the battle against COVID-19 and getting vaccinated is one of the best ways to protect yourself and others from COVID-19. People who have already been infected with SARS-CoV-2, should still get vaccinated unless told otherwise by their health care provider. It is important to contact the local healthcare professionals who are trained to advise on the availability of these vaccines and on its benefits and potential side-effects. Although these vaccines are effective in reducing the severity of the COVID-19 infection, it is uncertain how effective they are in preventing its spread. Even if one has been fully vaccinated, it is advisable when

leaving the house to wear a mask, maintain appropriate distancing and wash one's hands.

Despite the development of safe and effective COVID-19 vaccines in record time, the immediate foreseeable issue is "vaccine equity".[6] We are all aware that the virus is moving much faster than the global distribution of vaccines. The vast majority have been administered in high and upper-middle-income countries. If these doses had been distributed equitably, they would have been enough to cover all healthcare workers and older people globally. WHO set a target for all countries to vaccinate 10% of their populations by the end of September 2021. Although by the end of September, almost 6-and-a-half billion doses had already been administered worldwide, 56 countries effectively excluded from the global vaccine market place were not able to reach this target – and most of them in Africa. With global vaccine production now at nearly 1.5 billion doses per month, there is enough supply to achieve our targets, provided they are distributed equitably. This is not a supply problem; it's an allocation problem. Most manufacturers have largely spurned the opportunities to share technology and know-how and public health-oriented licensing, despite a number of mechanisms being set up. The global failure to share vaccines equitably is taking its toll on some of the world's poorest and most vulnerable people. New variants of concern mean that the risks of infection have increased in all countries for people who are not yet protected by vaccination. Vaccine equity will accelerate the end of the pandemic. Achieving WHO's vaccine equity targets will substantially increase population immunity globally, protect health systems, enable economies to fully restart, and reduce the risk of new variants emerging. It is heartening to note that as of 23 November 2021, 54.1% of the world's population have received at least one dose of the COVID-19 vaccine, 42.6% have been fully vaccinated and 2.7% have received a booster dose, a whopping total of 7.79+ billion doses till date! Despite the huge population, India's COVID-19 vaccination performance compares favourably with the worldwide data with 56% of the population having received at least one dose of the COVID-19 vaccine and 29.8% of the population being fully vaccinated, with a total of 1.18+ billion (118+ crore) doses administered.....a stupendous feat indeed!

Finally, the bottom line is that sexual and reproductive health needs do not cease to exist simply because COVID-19 demands greater attention and resources. Policymakers have a responsibility to use this crisis to inform investments in health care and to ensure that sexual and reproductive health and rights will not, once again, be left behind. In addition, the International Federation of Gynaecology & Obstetrics (FIGO)[7] has very recently announced that the integration of SRH services into the Universal health coverage (UHC) is being undertaken which aims to make promotive, preventive, curative and rehabilitative health services available for the entire population. This will hopefully ensure that quality healthcare services are controlled and regulated by governments, which are expected to subsidise the cost of provided services, making them available and affordable for the whole population regardless of socioeconomic status. The experience of countries that have integrated SRH services into UHC shows an increase in accessibility of services for marginalised populations.

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Original Article

The Role of 3D Bioprinting Technology in Medical Field – A Brief Review

Argha Nath[1], Ranjan Raychowdhury[2]

Abstract:

Three-dimensional (3D) printing is the construction of three-dimensional object from a computer-aided design which refers to a number of manufacturing technologies. 3D bioprinting was once a dream. However, time and investment has made the dream real. At present, the 3D bioprinting technology presents a great opportunity in the medical field enabling customised production of medical implants, changing the way doctors and surgeons plan procedures and offers great advantages for training. It has also made a huge impact on pharmaceutical companies, which can now create more specific drugs and run multiple trials at same time by making tissue scaffolds. Patient specific 3D-printed anatomical models are becoming increasingly useful tools in present practice of precision medicine and for personalized treatments. Today, 3D printing is offering clinical available medical products and platforms suitable for emerging research fields, including tissue and organ printing. In this review, our goal is to discuss recent techniques and application of 3D bioprinting in the medical field. The additive overview also provides manufacturing techniques and printable materials.

Keywords : 3D printing, tissue scaffold, anatomical model, organ printing.

Introduction :

Among the various type of manufacturing processes adapted by industries, three-dimensional printing (3D printing) is one of the additive techniques. 3D printing is the construction of three-dimensional objects from a computer-aided design (CAD) model or a digital 3D model. The image design is obtained from computer tomography (CT) and magnetic resonance imaging. 3D bioprinting was first developed in 1980s and was called rapid prototype technology. Initially this technique was only used in various industries with different printing techniques and materials.[1] With the rapid development of 3D printer, the overall 3D printing market grew to $9.9 billion in 2018 and is expected to reach $34.8 billion in 2024.[2] In 3D bioprinting the manufactured object can be created by fusing or depositing material onto or into a substrate. The materials deposited can be powders, plastics, ceramics, metals, liquids or living cells, making the process hugely versatile. When living cells are used to prepare a object, the term 3D bioprinting is used. It is related to the demand for the patient-specific design and fabrication of the final devices, such as joint prosthesis, surgical guides, and dental restorations.[3,4] In these days for medical education and surgical planning, 3D anatomical models are printed with microscopic anatomy structures.[5,6] Tissue and organ printing is an emerging field which is mainly focused on regenerative medicine and tissue engineering.[7] Preclinical patient-specific disease models are used for drug testing and screenings, which opens a research field for pharmaceutical companies

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to produce dose-customized drugs.[8] In this review we will discuss recent techniques and application of 3D bioprinting in medical field.

Work Flow of 3D Bioprinting :

Tissue acquisition: target area selection
↓
Segmentation: file conversion
↓
File optimisation for the final part (mesh correction)
↓
3D printer and material selection
↓
Print
↓
Validation and quality control

Types of 3D Bioprinting Techniques :

Additive manufacturing (AM) technology or 3D biprinting techniques was grown in the last decade starting from 1986. In that time stereolithographic system was first introduce in practice.[9] There are seven process of 3D printing which are represented by one or more commercial technologies.[9] All the processes are listed in Table1 with process description and technology it used.[10] This general information will help the users to choose the right technology depending on the application needed.

These technologies and the related advantages enable the researchers to improve existing medical applications that use 3D-printing technology and to explore new ones. The medical goal that has been already reached is significant and exciting, but some of the more revolutionary applications, such as bio/organ printing, require more time to evolve.[11]

Name of AM technique	Process description and technologies
Vat photo-polymerisation	Vat polymerisation uses a vat of liquid photopolymer resin, out of which the model is constructed layer by layer. This includes ● Stereolithography (SLA) ● Digital light processing (DLP)
Material jetting	Material jetting creates objects in a similar method to a two-dimensional ink jet printer. Material is jetted onto a build platform using either a continuous or drop on demand (DOD) approach. The only technology is ● Multijet modelling (MJM).
Binder jetting	The binder-jetting process uses two materials; a powder-based material and a binder. The binder is usually in liquid form and the build material in powder form. A print head moves horizontally along the x and y axes of the machine and deposits alternating layers of the build material and the binding material. This technique used in ● Powder bed and inkjet head 3D printing (PDIH) ● Plaster-based 3D printing (PP)

Material extrusion	Fuse deposition modelling (FDM) is a common material extrusion process. Material is drawn through a nozzle, where it is heated and is then deposited layer by layer. The nozzle can move horizontally, and a platform moves up and down vertically after each new layer is deposited. The technologies are ● Fused deposition modelling (FDM) ● Fused filament fabrication (FFF)
Powder bed fusion	This process includes ● Direct metal laser sintering (DMLS) ● Electron beam melting (EBM) ● Selective heat sintering (SHS) ● Selective laser melting (SLM) Selective laser sintering (SLS)
Sheet lamination	This includes ● Ultrasonic additive manufacturing (UAM) ● Laminated object manufacturing (LOM). The ultrasonic additive manufacturing process uses sheets or ribbons of metal, which are bound together using ultrasonic welding
Directed energy deposition	This process covers a range of terminology: "Laser engineered net shaping, directed light fabrication, direct metal deposition, 3D laser cladding" it is a more complex printing process commonly used to repair or add additional material to existing components. The only technology it used ● Laser metal deposition (LMD)

Table 1 : Summary of 3D printing process and technologies (Aimar et al. 2019)

Transformation Process and functional biomaterials for 3D bioprinting :

Materials used in 3D printing are transformed during the production of the specific model by changing their consistency. The correct selection of the material is directly linked to the selection of the 3D-printing process and printer, as well as the requirements of the model. All details of materials used in 3D bioprinting are shown in Table 2 with their medical use.

3D printing with tissue engineering has been focused on functional biomaterials for tissue implantation and tissue models for disease studies. Functional biomaterials are manufactured with AM technologies.

Tissue scaffolds are important component of 3D printing tissue engineering. They can provide structural supports for cell attachment, proliferation and migration (Figure 1). Tissue engineering scaffolds and basic medical scaffolds are considered different especially in biological activity and application purposes.[12] Good bioactivity, excellent biocompatibility, and

appropriate mechanical property are three basic requirements for an ideal tissue engineering scaffold. Tissue engineering scaffolds are fabricated by two major methods, printing with cells mixed in ink or gel and seeding cells onto scaffolds post printing. [Fig. 1]

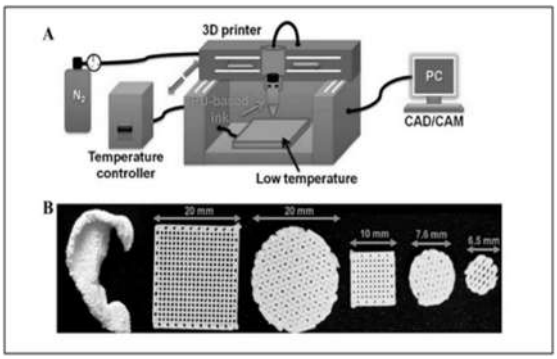

Figure 1 : Functional biomaterials and related printing technique. (A) Schematic of a 3D printing platform for performing a water-based biological scaffold. (B) Appearance of 3D printed brackets in various shapes and sizes. Reproduced, with permission, from (Hung et al., 2016).

For a better future, the multi-material composites seem to represent a good chance for the 3D printing of human tissues since none of the current available material is able to fully mimic elastic and biological tissues. Multi-material composites may be designed based on the capacity of the selected biological material to replicate the mechanical properties of human tissue.[13] Mechanical testing may represent a necessary tool to analyse the biomechanical response and validate the artificial material.

Moreover, it is also important to mention that 3D printing allows the reproduction of implantable custom device, but still deeper research needs to be done in order to examine the differences between the traditional and additive manufacturing in terms of mechanical and structural properties, especially fatigue limit needs to be examined further.[14]

Name of AM technique	Materials	Medical use
Vat photo-polymerisation	Photopolymer resin	● Bone ● Dental models ● Dental implant guides ● Hearing aids
Material jetting	I. Plastics II. Polymers: polypropylene, HDPE, PS, PMMA, PC, ABS, HIPS, EDP	● Medical models ● Dental casts ● Dental implant guides
Binder jetting	I. Stainless steel II. Polymers: ABS, PA, PC III. Ceramics: glass	● Colour models especially colour coding of anatomy
Material extrusion	I. Plastics II. Polymers : ABS, nylon, PC, AB	● Medical instruments and devices ● Rapid prototyping exoskeleton

Powder bed fusion	Powder-based materials. Common metals and polymers used are I. SHS: nylon II. DMLS, SLS, SLM: stainless steel, titanium, aluminium, cobalt chrome, steel III. EBM: titanium, cobalt chrome, stainless steel material, aluminium and copper	• Models that require a lattice, medical devices such as implants and fixations
Sheet lamination	I. Paper, plastic and sheet metals	• Orthopaedic modelling of bone surfaces
Directed energy deposition	I. Metals: cobalt chrome, titanium	• Limited. Commonly used to repair existing parts and build very large parts

Table 2: Summary of materials used in 3D bioprinting and their medical uses (Aimar et al. 2019)

Use of 3D bioprinting in different Medical Fields :

Surgical Planning :

3D printing has possible application that have emerged is surgical planning. It helps surgeon to study the anatomy of various defects in complex organs such as the brain or the heart, or anatomical specimens such as the pelvis or the spinal cord, and using the information for surgical planning [Fig.2]. 3D models can assist surgeons to study the impaired organs before the operation. This also helps to explore various approaches and acquire hands-on experience before entering the operating room. This process shortens operation time significantly, and ultimately improves the outcome of the operation for the patients and the surgeons.[15]

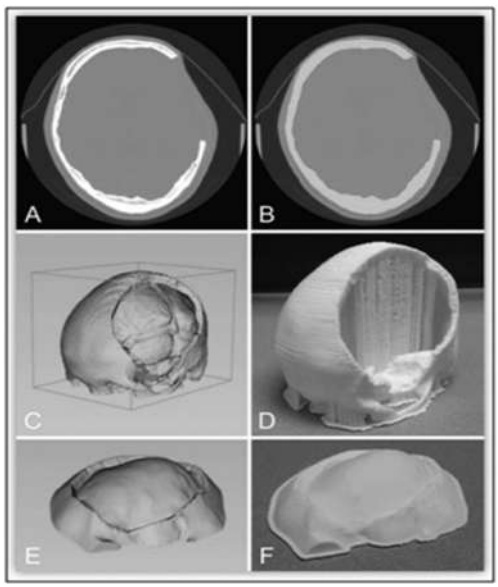

Fig. 2 : 3D printed skull and mold (D,F) from high resoluti on CT scan data (C,E) using the fused depositi on modelling method. (Paul et al. 2018)

Prostheses :

Due to recent advancement in 3D printing, patient-specific prostheses allow a wide range of disabled people affected either by an accident or a genetic deformity to carry on their normal life.[16] With the aid of high-quality imaging technology, 3D printing has the capability to create a precise anatomic prosthesis used in various medical applications.[17,18] This has also made significant impact on the field of dentistry.[19,20]

Medical Education and Training :

Training novice medical physicians using cadaveric materialsis a subject of controversy. This is both due to ethical issues as well as the cost of the process. 3D printing techniques can offer an effective substitute by reproducing accurate complex anatomical organs from high resolution CT imaging for many cases [Fig. 3]. In addition, the ability of 3D printing to reproduce a number of copies of any anatomical subject in different sizes gives a great advantage in training facilities.[21]

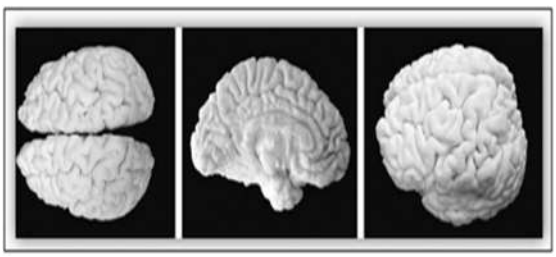

Fig. 3 : Anatomically accurate 3-D printed brain model. (Paul et al. 2018)

Medical Research :

The advancement of printers now days have enough capacity to print cells directly, which results in the automated production of cell structures for toxicity testing, and the development of new treatments for various diseases and tumors. Data from Colins et al, 2011 shows that, up to 50% of drugs that pass preclinical testing are later found to be toxic to humans, while others may be non-toxic to humans despite being toxic in animal testing.[22] Similarly,the ability to reproducibly print tissues that match to the actual cellular arrangement like natural tissues and organs allows researchers to accelerate the research process and run multiple tests in same tissue.

Organ Printing :

3D printing is already used in the production of human organ and tissue structures for research [Fig. 4]. Organ printing can be integrated with biocompatible microfluidics to create highly complex structures to mimic the function of the human organs.[23] The next step of this process is printing organs that can be transplanted into human donors, or even printing organs in the body in-situ in the operating room. While this technology is less mature, it has the potential to revolutionize medicine, making organ transplants and current synthetic artificial organs obsolete.[24]

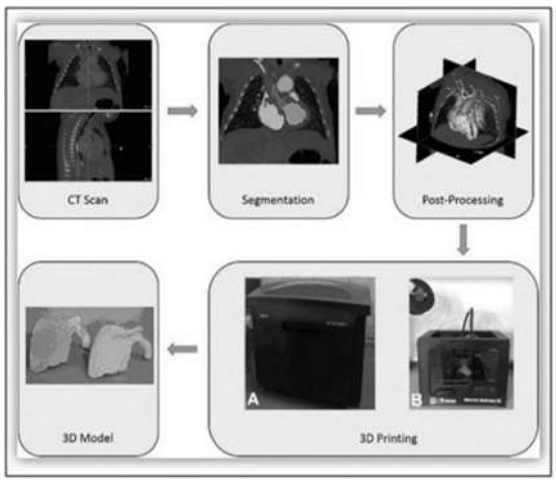

Fig. 4 : Flowchart of creating a 3D printed model of congenital heart defects from CT scan data. (Paul et al. 2018)

Drug Delivery :

Drug delivery system have changed after 3D printing integrated to pharmaceuticals. Now drugs can be printed not only in specified doses for each individual, but with multiple sustained release and immediate release layers, which allow the dosage profile to be modified. This process enables personalized treatments, and also helps patients under heavy medication, who may be able to reduce the number of pills they need to take. 3D printed drug delivery devices which will fit exactly to the anatomy of a patient are also under development. The applications of 3D printing in medicine are now so numerous that an exhaustive and comprehensive study of them all is practically impossible. Several recent reviews have published in one particular field, such as Mehndiratta et al.'s review of 3D printing based on medical imaging[25], Martelli et al.'s review of 3D printing in surgery[26] and Pati et al.'s review of bioprinting for tissues and organs.[27] This review will look at developments in each of the applications we have described above.

Discussion :

This paper described various applications of 3D bioprinting in medical field. We also learned some of the recent developments and tried to make some realistic prediction for the future. Nowadays, although the additive manufacturing offers a huge potential for the manufacturing, the 3D-printing products do not have a proper legal status that defines them, both for implantable and non-implantable devices. All the 3D-printed products are categorized as custommade device under the Regulation (EU) 2017/745 of the European Parliament and of the Council of the 5 April 2017.[28] Thus, these medical devices do not require affixation of CE markings and have a significant and constraining procedure demonstrating the safety and the performance of the device for the patient.

3D printing technology has the potential to significantly change the clinical field, improving medicine and healthcare, making care affordable, accessible, and personalized. As printers evolve, printing biomaterials get safety regulated and the general public acquires a common sense about how 3D printing works. There are several pros and cons of this techniques (Table 3) but in near future this technique will help medical field in all the ways.

Name of AM Technique	Pros	Cons
Vat photo-polymerisation	i. High resolution and accuracy ii. Complex parts iii. Decent surface finish: smoother finish iv. Flexible printing setup	i. Lacking in strength and durability ii. Still affected by UV light after print iii. Not for heavy use

Material jetting	i. High accuracy ii. Low waste of material iii. Multiple material parts and colours in one process	i. Required support material ii. Limited materials: only polymers and waxes are supported
Binder jetting	i. Range of colours ii. Multiple materials supported iii. Faster iv. Different binder-powder combination for various mechanical properties	i. Not always suitable for structural parts ii. The cleaning of the 3D-printing result needs time and increases the time of the procedure
Material extrusion	i. Inexpensive process ii. Widespread iii. ABS plastic supported: good structural properties and easily accessible	i. Dependence of quality on the noozle radius: bigger nozzle leads to less quality ii. Low accuracy and dependence on the nozzle thickness iii. Low speed iv. Contact pressure needed to increase quality
Powder bed fusion	i. Inexpensive ii. Small technology: office size machine iii. Large range of material options	i. Low speed; lack of structural properties in materials ii. Limited sizes iii. Dependence on powder grain size
Sheet lamination	i. Speed ii. Inexpensive iii. Ease of materials handling	i. Dependence on paper or plastic material ii. Need of postprocessing iii. Limited material range
Directed energy deposition	i. High control of grain structure ii. High-qualitydependent on speed iii. Highaccuracydependent iv. Fast built with rapid material deposition v. Fully dense parts; no need for supports vi. Best process for part repair	i. Limited range of materials ii. Poor surface quality iii. Wire process is less accurate

Table 3 : Pros and cons of 3D printing techniques (Aimar et al. 2019)

In case of pharmaceutical field, the concept of 3D printers is close to reality. The possible benefits to this work are clear from the papers cited here.[29,30] This indicates the increased prevalence that printers may have in pharmaceuticals in the near future.

Conclusion :

The 3D bioprinting in medical field and design has already achieved outside the norm for changing the health care. Like any new technology, 3D printing has introduced many advantages and possibilities in the medical field. The three main burdens of this new technology are the ability to treat more people, to obtain outcomes for patients and less time required under the direct case of medical specialists. These techniques are not available to the majority of patients. We hope in near future 3D bioprinting will become accessible to every corner of medical treatment.

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Original Article

Pulmonary Oedema in A Case of Severe Preeclampsia : A Near-miss Case in Pregnancy

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Abstract :

Maternal mortality reduction is a prime component of Millennium Development Goal. To achieve the target WHO adopted Near miss pregnancy case reporting. Pregnant mothers who during antenatal period, delivery & 42 days within child birth nearly died but survived, qualify for this. Preeclampsia is a dreaded condition of pregnancy and becomes lethal when progresses to pulmonary edema. A maternal near-miss case[1] is a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy. Timely diagnosis and proper holistic management can do wonders. Here we present a case of a 30 years old primigravid patient diagnosed with preeclampsia, who progressed to pulmonary edema and how she was managed.

Key words :

Maternal near-miss, Preeclampsia, Pulmonary edema

Introduction :

Pulmonary oedema is a pathological condition where abnormal fluid accumulation occurs in the pulmonary interstitiumand alveoli. It results in impairment of gaseous exchange in the lung, as reflected by the development of hypercarbia and hypoxia. In pregnancy the condition occurs due to, or gets aggravated because of, the conditions like cardiac diseases, preeclampsia, use of tocolytics or fluid overload. Pulmonary oedema of any aetiology must be managed aggressively in its incipient stage otherwise it can be disastrous for the patient.

A maternal near-miss case is a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy. Near-miss cases share many characteristics with maternal deaths and can directly inform about obstacles that had to be overcome after onset of an acute complication.[2]

Here we report the case of a 30 years old primigravida, who suffered from acute severe pulmonary oedema as a complication of severe preeclampsia.

Patient & Observation :

A 31 years old primigravida, conceived through ovulation induction was registered in our hospital at 12 weeks period of gestation (POG). All the antenatal tests were normal except thyroid function: she was suffering from pregnancy induced overt hypothyroidism and was euthyroid on appropriate medication. She was doing well till the end of her second trimester. After that she was found to be hypertensive at OPD and was advised BP monitoring at home, which confirmed Hypertensive disorder of pregnancy. Biochemical tests stamped it as a case of preeclampsia. An oral antihypertensive was started and turned her normotensive. At 37 weeks POG she was admitted for confinement in normotensive condition.

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After admission, her BP was 170/100 mm Hg, urine albumin 3+, and modified Bishop's score 5. She was prepared for emergency caesarean section after stabilizing the blood pressure. She was given injection Labetalol 20 stat but her pressure rose to 180/110mm and she suddenly became restless.

The patient suddenly had dyspnoea, stage III, cold peripheral extremities, and her oxygen saturation dipped to 87%. She had peripheral oedema, associated with coarse crepitations over bilateral basal areas. She was shifted to the Intensive Care Unit, given moist oxygen inhalation at 10 litres per minute, intravenous Furosemide (80mg), restricted intravenous fluid, intravenous labetalol and magnesium sulfate infusion with proper monitoring of pulse, BP, respiratory rate, oxygen saturation, input output charting etc. After initial stabilization she was put up for caesarean section after confirmation of foetal heart rate. During intubation for caesarean section, the patient suffered a cardiac arrest. Her pulse rate decreased with decreasing oxygen saturation. Intravenous atropine and adrenalin were given along with CPR for 20-30 minutes. After stabilization she was operated upon after confirming the fetal heart sound.

Postoperatively she was put on volume control ventilator mode for 24 hours and then shifted to semi-invasive mode of ventilation. She was shifted to the general ward with 10 litres per minute oxygen support. After about 72 hours the patient became normotensive on oral antihypertensive and dyspnea disappeared.

She delivered a male baby weighing 2.66 kg, who was initially put on ventilator but gradually improved and stepped down to noninvasive mode and later maintained in room air.

Discussion :

Preeclampsia is defined as new onset hypertension in a previously normotensive woman after 20 weeks of period of gestation measured twice at an interval of 4 hours associated with proteinuria. Nowadays a few symptoms and signs have been included with the above mentioned criteria to identify atypical preeclampsia cases, with an aim to reduce the maternal and fetal morbidity and mortality.[3]

They are as follows

1. Platelet count less than 1.5 lakh /cu mm
2. Deranged liver enzymes
3. Deranged renal profile
4. Pulmonary oedema
5. New onset headache, visual disturbances not attributed to any other condition.

So pulmonary oedema itself is a defining characteristic for preeclampsia. The incidence of pulmonary oedema during pregnancy all over world is around 0.08%.[4] Although the number seems insignificant,the mortality and morbidity arising out of it is significantly higher. The condition surfaces mostly during the immediate postpartum period. Obstetric ICU admission rate owing to Pulmonary oedema is approximately 1.5% and occurs in 9.3% of the patients admitted with near miss criteria.

This fulminant condition is mainly diagnosed clinically. Echocardiography and Doppler studies help to distinguish from non-cardiogenic conditions.

The condition is managed by a multidisciplinary approach : internist, cardiologist, anaesthetist and pulmonologist all have their role in diagnosis and management along with the obstetrician.

The condition should be identified in earliest stage. Moist oxygen inhalation, intravenous furosemide, restricted fluid administration, intravenous labetalol and intravenous nitroglycerine are the mainstays of the management.[5]

Chest x ray, echocardiography and doppler can buttress the clinical criteria. With proper management the mean ICU stay is about 5 days and that of hospital is about 11 days.

Conclusion :

In preeclampsia, acute pulmonary oedema is one of the leading causes of maternal mortality. Preconceptionally and during the antenatal period, the pregnant mothers must be assessed for hypertensive disorders via PIERS system.[6] Early identification of potential patients, counselling, low dose aspirin are preventive measures. Early oral antihypertensive with regular BP monitoring and information about danger signs like headache, right upper abdominal pain, visual blurring can be helpful. With high clinical suspicion pulmonary edema can be clinically diagnosed and with judicious fluid administration along with diuretics, antihypertensive and general care the prognosis is good.

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Original Article

Overview of A Swallow Clinic

Susmita Ghosh

Abstract :

Swallowing is a dynamic process and hence a dynamic assessment is needed to assess its physiology. Apart from clinical assessment we require instrumental tests like FEES (Functional Endoscopic Evaluation of Swallowing), and radiological investigation as VFSS (Video Fluoroscopic Swallow Study). For a proper comprehensive care in a swallow clinic, a multidisciplinary approach with ENT surgeons and Swallow Therapist is required.

Keywords :

Swallow clinic, Dysphagia, FEES, VFS, team work.

Introduction :

Swallowing is an important complex function of our body. It is the process by which a bolus (solid / liquid) is transported from the oral cavity to the stomach. It consists of two discrete events - airway protection and bolus propulsion. The function uses about 35 muscles, in a sequential manner, under central nervous system control. A person swallows spontaneously about 900 times per day.[1]

Dysphagia is difficulty in swallowing. It may lead to aspiration, dehydration, malnutrition, weight loss, psychological and a financial impact. Swallow disorders may occur in the oral, pharyngeal or oesophageal phase, or they may be of mixedaetiology. We, as clinicians, are more concerned with swallow safety, hence early intervention is required to prevent aspiration.

The Candidates of Swallow Clinic :

Patients who suffer from a stroke, with Parkinsonism, Motor Neurone Disease, Alzheimer's disease, elderly debilitated persons, post head and neck surgery especially due to cancer, trauma, myasthenia gravis etc – all these patients will benefit from a specialist swallow clinic intervention.

What We Do at The Swallow Clinic?

A comprehensive review of the history and presentation is undertaken, and a clinical examination is performed. Then specialised investigations such as Functional Endoscopic Evaluation of Swallowing (FEES) and Video Fluoroscopic Swallow Study are performed. The purpose is to evaluate the structural and functional integrity of swallow function and set up a treatment protocol.[2] Involvement of other specialists, eg, Neurologists, Gastroenterologists, Head and Neck Oncologists, Dieticians and Psychologists may be required for specific patients.

Clinical assessment : One thing that should be kept in mind is the cognition of the patient. Sometimes a patient is so sick that a history may only be elicited from the relatives, and a rough idea of aspiration, by observing the desaturation on pulse oximeter whilst eating, is the only means of assessment. In others only bedside examination is possible.

Patients may present with difficulty in food intake or swallowing, in chewing food, with

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leakage of food from the mouth, dysphagia particularly to solids or liquids, cough during or sometime after swallowing, throat clearing, weight loss, recurrent chest infection, and hesitation to take food.

Clinical assessment includes examination of oro-motor functions (Fig 1), observation of pooling of saliva, drooling, laryngeal movement in dry swallow, voice quality and cough. A trial swallow is done with 5ml bolus of clear water, and the act of swallowing is observed.

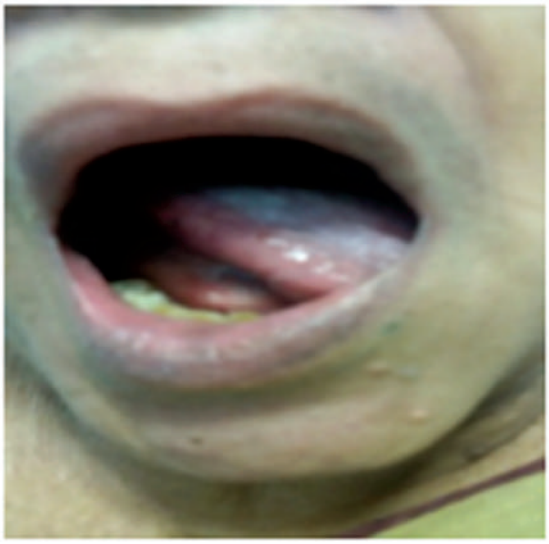

Fig 1: Examination of tongue movement

Instrumental Tests : The basic assessment is FEES, as it is a dynamic test of swallow physiology. It can be done in the clinic (Fig 2) or as a bedside procedure. A flexible fibreopticlaryngoscope is needed. No anaesthesia is used as the act of swallowing needs to be observed. At first the mucosa is observed for locallesions, pooling of secretions and vocal fold movement. Next, food mixed with food dye of different consistencies are given and patient is asked to swallow. The efficacy of swallow,i.e., whether the food is effectively propelled or residue remains, and the safety of swallow, i.e., whether any penetration or aspiration is occurring, and the efficiency of cough and laryngeal sensitivity are all observed. Then different manoeuvres are tried for feeding.[3] Different internationally accepted standardized scales are used for reporting the degree of impairment.

Fig 2 : FEES being performed

Radiological Tests : Another commonly used assessment is VFSS (Fig 3). Here collaboration between ENT and the Radiology unit is required. All the three phases of swallow are observed in real time. Here food mixed with barium or gastrograffin is used.

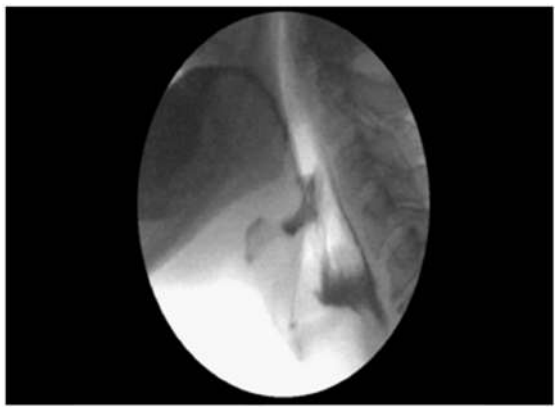

Fig 3 : VFSS

Ultimate aim : Both tests have their advantages and disadvantages, but are complimentary to

each other. The nature of the swallow problem is found out and a treatment protocol determined. The aim of treatment is to restore swallow function and improve life quality. Protection of the airway (prevention of penetration and aspiration), i.e. making swallow safe, is our prime concern. Decisions on oral feed or alternate feed, texture of food, and the nature of intervention are decided.

Treatment Approaches :

1. Diet modification – The consistency and bolus size of food is modified.
2. Swallow therapy - Therapy consists of compensatory manoeuvres, as well as a strengthening workout to retrain the muscles of deglutition. Electrical stimulation of the muscles is also used.
3. Surgical intervention - It is another pillar of treatment. It targets the improvement of sphincteric mechanisms, reduction of extra or intra luminal obstruction, and palliation. The different surgical procedures include cricopharyngeal botulinum toxin injection, cricopharyngeal myotomy, injection laryngoplasty, thyroplasty etc. In palliative cases tracheostomy or laryngotracheal separation is done.[4]

Evaluation :

Follow up is done every 4 to 6 weeks. Weight gain, improvement in speed of eating, and upgradation of the diet texture are the determining factors of progress. The ultimate aim is that the patient should take more than 60% of his total diet orally, without aspirating.

Conclusion :

The Swallow Clinic is basically a team work of ENT Surgeons and Swallow Therapists. The rationale behind it is that two specialists with different professional backgrounds see the same patient simultaneously with a single protocol for better continuity of care. It requires dedicated trained nursing staff. A multidisciplinary approach is imperative for best outcomes.

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Original Article

Lung Sonography for Assessment of Perioperative Atelectasis — An Observational Study

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Abstract :

Lung ultrasonography is a safe, accurate and easily accessible point-of-care imaging modality that is increasingly being adopted in modern anaesthesiology and critical care practice. To observe the development of atelectasis in the perioperative period using lung ultrasonography, we studied 110 patients who underwent elective laparoscopic abdominal and gynaecologic surgeries under general anaesthesia, and assessed them for development of atelectasis using the Lung Ultrasonography Score (LUS).

A higher LUS score was detected in older patients as compared to younger patients (Pearson value 0.266 at A, P value 0.005; Pearson value at B 0.411, P value <0.001; Pearson value at C 0.410, P value <0.001; Pearson value at D 0.387, P value <0.001; Pearson value at E 0.487, P value <0.001). Perioperative atelectasis was more commonly seen in obese patients (Z= 3.60; p<0.001). Atelectasis increased with increased pneumoperitoneum time and anaesthesia time (Pearson value 0.670, P value<0.001). A slight decrease in oxygen saturation was associated with raised LUS score (mean at D and E were 99.63±0.93 and 99.45±1.36 respectively as compared to 99.97±0.29 at A). Postoperative pain contributed to the development of atelectasis (Pearson 0.395 at D, Pearson 0.398 at E, p value <0.001).

Keywords :

Lung Ultrasound, Perioperative, Atelectasis

Introduction :

Atelectasis is a very common phenomenon during general anaesthesia (GA). It occurs as a consequence of a 20% reduction of the functional residual capacity. This reduction is caused by the loss of respiratory muscle tone, dorsal decubitus positioning, and loss of nitrogen during the preoxygenation period.[1] It is estimated that up to 10% of patients undergoing GA for abdominal surgery will experience postoperative pulmonary complications.[2] Pneumoperitoneum contributes to development of atelectasis by pushing the diaphragm upwards due to the increase in intra-abdominal pressure; thus, laparoscopic surgeries under general anaesthesia are prone to develop atelectasis perioperatively. Some authors have suggested that atelectasis might be an important culprit in the development of postoperative pulmonary complications.[3-6] So, if atelectasis can be diagnosed intraoperatively, the incidence of postoperative pulmonary complications may be reduced. The lack of diagnostic tools available to anesthesiologists in the operating room leads them to treat hypoxemic episodes by increasing the FiO_2. If atelectasis is detected intraoperatively, it can be managed by certain corrective measures. Lung ultrasonography is a safe, easily accessible point-of-care imaging modality that is being increasingly adopted in modern anaesthesiology practice. It is a non-invasive, convenient and portable technique, devoid of the risks associated with repeated

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exposure to ionizing radiations of the chest x-ray; which is not always feasible in the perioperative period. The sensitivity for detecting all kinds of alveolar consolidation is 90% , and the specificity 98%, by lung ultrasonography.[7] This study was an attempt to observe atelectasis in the perioperative period in patients undergoing laparoscopic surgeries using lung ultrasonography.

Methods :

This prospective, time framed, observational study was conducted in Apollo Gleneagles Hospitals, Kolkata after clearance from the Institutional Ethical Committee. A total of 110 patients were recruited from November 2017 to November 2018.

Inclusion criteria for this study were as follows:-

- Patients undergoing elective abdominal or gynaecologic laparoscopic surgeries
- Patients over 18 years of age
- ASA 1 and ASA 2
- Patients who were mentally able to give written and informed consent.

The exclusion criteria were as follows :-

- BMI> 40kg/m2
- ASA 3, 4 or 5,
- History of any intrathoracic procedure including chest tubes
- Very severe pulmonary disease
- Pregnancy.

All patients were administered general anaesthesia. Volume controlled ventilation was used for ventilating the patients with the following settings : a tidal volume of 8ml/kg of predicted body weight, a respiratory frequency of 12 breaths/minute adjusted to obtain end tidal carbon dioxide of 30 to 35 mm of Hg, an inspiratory to expiratory ratio of 1:2, and a Positive End Expiratory Pressure of 6 cm of water. After a 3-minute preoxygenation period using 100% oxygen, GA induction was performed using propofol (1.5mg/kg) and fentanyl (1mcg/kg). Tracheal intubation was facilitated with atracurium (0.5mg/kg) or cisatracurium (0.2mg/kg). Adequate muscle relaxation was maintained with supplemental atracurium or cisatracurium administration as required. Neuromuscular blockade was reversed at the end of surgery with neostigmine (0.05mg/kg) and glycopyrrolate (5mcg/kg). For lung ultrasonography, the thorax was divided into 8 quadrants (Figure 1). Each hemithorax was separated into 4 quadrants : anterior and postero-lateral zones separated by the anterior axillary line each divided in upper and lower portions by a line drawn at the level of nipples as shown in the figure. For scanning, a convex array 2- to 5-MHz transducer was used and depth was kept at 12-15 cm. The transducer was placed between rib spaces and aligned with the longitudinal axis of the patient. The orientation marker faced cephalad. Images were obtained at 5 predefined time points : before GA induction (time point A), 5 minutes after GA induction (time point B), 5 minutes after insufflation of the pneumoperitoneum (time point C), 15 minutes after the arrival of patients in the recovery room (time point D), and immediately before the discharge from the recovery room (time point E). Atelectasis was assessed by LUS score.[8] Monastesse Audrey et all[7] found that a modified LUS score was more sensitive but LUS score is a simple grading system, hence, we used LUS score for convenient assessment. Each of the 8

quadrants was assigned a score of 0 to 3 according to the LUS scoring system mentioned below in the table. The LUS score (0–24) was then calculated by adding up the 8 individual quadrant scores. Higher scores indicated extreme aeration loss (Table 1).

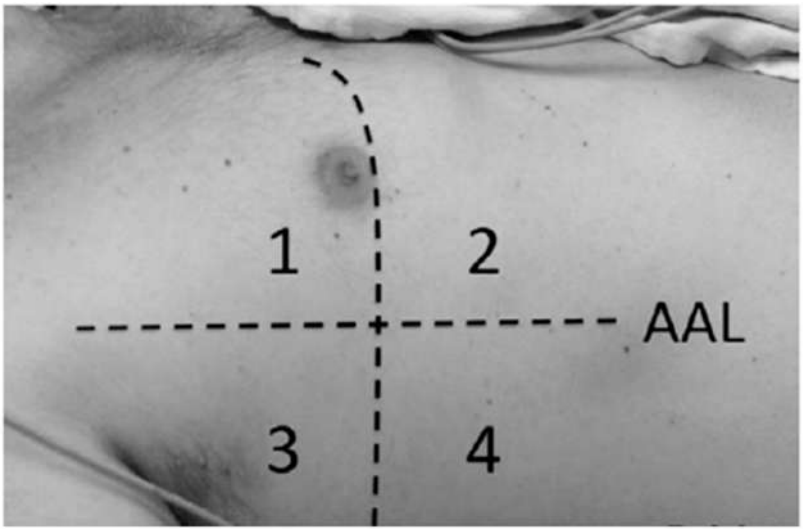

Figure 1 : Each hemithorax is separated into 4 quadrants: anterior and postero-lateral zones separated by the anterior axillary line each divided in upper and lower portions by a line drawn at the level of nipples.

	Normal aeration	**Small loss of aeration**	**Moderate loss of aeration**	**Severe loss of aeration**
Quotation	0	1	2	3
Original LUS score	0-2 B lines	>=3 B lines	Multiple coalescent B lines	Consolidation
Modified LUS score	0-2 B lines	>=3 B lines or 1 or multiple small subpleural consolidation separated by a normal pleural line	Multiple coalescent B lines or multiple small subpleural consolidation separated by a thickenedor irregular pleural line	Consolidation or small subpleural consolidation of >1 x 2 cm

Table 1 : LUS scoring system

Results :

The statistical analysis was performed with the help of Epi Info™ 3.5.3 which is a trademarked software of the Centers for Disease Control and Prevention (CDC). A p-value of $p<0.05$ was taken to be statistically significant. Pearson's correlation was used to find any correlation between some parameters and the LUS score.

Age (in years)	Number	%
<20	1	0.9%
20 – 29	20	18.2%
30 – 39	32	29.1%
40 – 49	34	30.9%
50 – 59	18	16.4%
60 – 69	5	4.5%
Total	110	100.0%
Mean ± s.d.	40.40±10.91	
Median	40	
Range	18 – 67	

Table-2 : Distribution of age of the patients

The age distribution of our study group is shown in Table 2. Most of the patients (60.0%) were within the age range of 30 - 49 years.

BMI (kg/m^2)	Number	%
Normal	29	26.4%
Overweight	27	24.5%
Obese	54	49.1%
Total	110	100.0%
Mean ± s.d.	24.18±2.52	
Median	24	
Range	19 – 29	

Table-3 : Distribution of BMI of the patients

Table 3 shows the Body Mass Index (BMI) distribution of our study group. Most of the patients were obese (49.1%).

Pneumoperitoneum time (In minutes)	Descriptive Statistics
Mean ± s.d.	74.50±48.50
Median	50
Range	20 – 220

Table-4 : Distribution of pneumoperitoneum time of the patients

The duration of pneumoperitoneum in the patients is depicted in Table 4. The mean pneumoperitoneum time (mean ± S.D.) of the patients was 74.50±48.50 minutes with a range of 20 to 220 minutes and the median was 50 minutes.

Duration of anaesthesia (In minutes)	Descriptive Statistics
Mean ± s.d.	94.50±48.50
Median	70
Range	40 – 240

Table-5 : Distribution of duration of anaesthesia of the patients

The mean duration of anaesthesia (mean ± S.D.) of the patients was 94.50±48.50 minutes with range 40 – 240 minutes and the median was 70 minutes, as shown in Table 5.

The mean level of SpO_2 of patients at diff. time interval is shown in Table 6.

Time Interval	Level of SpO_2 (in %) (Mean ± S.D.)
A	99.97±0.29
B	100.00±0.00
C	100.00±0.00
D	99.63±0.93
E	99.45±1.36

Table-6 : Distribution of level of SpO_2 of the patients at different time interval.

One way ANOVA showed that there was significant difference in mean level of SpO_2 of the patients at different time intervals. ($F_{4,545}$= 13.07; p<0.0001). As per Tukeys Critical Difference (CD) mean level of SpO_2 significantly increased over time then again decreased significantly (p<,0.001). [Table 7]

Parameters	Pearson Correlation and p-value	LUS at A	LUS at B	LUS at C	LUS at D	LUS at E
Age	Pearson Correlation	0.266**	0.411**	0.410**	0.387**	0.487**
	p-value	0.005	<0.001	<0.001	<0.001	<0.001
	p-value	0.086	0.003	0.001	<0.001	<0.001
Pneumo time	Pearson Correlation	0.062	0.311**	0.494**	0.670**	0.767**
	p-value	0.521	0.001	0.000	0.000	0.000
Duration of anaesthesia	Pearson Correlation	0.062	0.311**	0.494**	0.670**	0.767**
	p-value	0.521	0.001	<0.001	<0.001	<0.001
VAS at D	Pearson Correlation	0.049	0.373**	0.420**	0.388**	0.395**
	p-value	0.610	<0.001	<0.001	<0.001	<0.001
VAS at E	Pearson Correlation	0.044	0.369**	0.417**	0.388**	0.398**
	p-value	0.646	<0.001	<0.001	<0.001	<0.001

Table-7 : Correlation between LUS at different interval and other parameters

**** Statistically Significant**

Discussion :

A previous observational study by Yu X et al [9] showed that lung ultrasound can detect atelectasis with a sensitivity of 87.7%, a specificity of 92.1% and a diagnostic accuracy of 90.8%. They compared their findings with CT scan and found that LUS scores were highly correlated with the atelectasis volume of CT (r=0.58, P<0.0001). The study of Yang Jian-Xin et al[10] also compared LUS score and CT for detecting atelectasis and they also found a very high concordance between ultrasound and CT with a Kappa coefficient of 0.825 (P = 0.031); so they concluded that lung ultrasound is a safe, dynamic and accurate

imaging method to diagnose and manage lung atelectasis. Touw H. R.et al[11] showed in a study that LUS is an excellent tool for diagnosing postoperative lung complications. Acosta Cecilia M et al[12], in their study, found that the detection of atelectasis by lung ultrasonography was excellent; Liu Jing et al[13] observed in a study, carried out in 80 neonates, that the sensitivity of lung ultrasound to detect neonatal pulmonary atelectasis was 100%; Lichtenstein D et al[14], in their study, proved that lung ultrasound could detect statistically significant alveolar consolidation. In another study Nazerian P et al[15] concluded that the sensitivity of LUS was 91.7% and specificity was 97.4% for diagnosis of consolidation and also they showed that LUS was superior to chest x-ray. All the above-mentioned studies showed lung ultrasound to be an accurate method of viewing and diagnosing atelectasis. Our study also found LUS to be an excellent tool for diagnosis of atelectasis. In our study, out of 110 patients, we detected B-lines in 90 patients as evidence of aeration loss which indicated development of ateletasis.

In the study by Monastesse Audrey et al[7], the authors opined that higher LUS score is associated with increasing age. Our study also showed that there is significant correlation between age and LUS score (Pearson value 0.266 at A, P value 0.005; Pearson value at B 0.411, P value <0.001; Pearson value at C 0.410, P value <0.001; Pearson value at D 0.387, P value <0.001; Pearson value at E 0.487, P value <0.001). We observed higher LUS score in elder patients compared to younger populations which indicates that old age is a predisposing factor for development of perioperative atelectasis. Monastesse Audrey et al[7] found no correlation between BMI and LUS score, but our study suggests significant prevalence of perioperative atelectasis in obese patients ($Z= 3.60$; $p<0.001$). They also found that with increasing duration of pneumoperitoneum, the LUS score was more. Our study also found significant correlation between pneumoperitoneum time and LUS score (Pearson value 0.670, P value<0.001) and our mean pneumoperitoneum time was 74.50±48.50 minutes with range 20 – 220 minutes. We also observed a higher LUS score in patients who were positioned in a head low state as compared to other patients who were in a neutral position or slightly head-up position.

Monastesses Audrey et al[7] also observed atelectasis was moderately correlated with oxygen saturation. We too observed slight decrease in oxygen saturation of the patients is associated with increasing LUS score. Mean oxygen saturation at D and E were 99.63±0.93 and 99.45±1.36 respectively as compared to 99.97±0.29 at A (i.e., before induction of anaesthesia)

The same group showed that there is no correlation between pain and LUS score. We found significant statistical correlation between pain and LUS score (Pearson 0.395 at D, Pearson 0.398 at E, p value <0.001). So, our study suggests that pain contributes to the development of postoperative atelectasis which can be detected by lung ultrasound.

Conclusion :

Atelectasis developed in the perioperative period can be detected accurately using lung ultrasonography and it is crucial to detect it early to prevent postoperative pulmonary complications.

Conflict of Interest : None declared

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Case Report

A Case of Malignant Peripheral Nerve Sheath Tumour — A Histopathologic Account

Ishita Ghatak[1], Pranamita Ray[2], Soumit Dey[3], Jhuma Nandy[4]

Abstract :

Malignant Peripheral Nerve Sheath Tumour (MPNST) is a tumour of neuro ectodermal differentiation arising in soft tissue. It occurs in two forms, either sporadic or as part of Neurofibromatosis Type1(NF1). We present the case of an 83 years old man with a large ulcerated soft tissue mass over his right forearm. The mass was removed by wide local excision, with a provisional diagnosis of soft tissue sarcoma. Histopathological examination showed florid growth of atypical spindle cells in a pattern resembling the architecture of a peripheral nerve. The tumour arose in dermis, with a connective tissue sheath resembling perineurium, and showed septae arising from the surrounding sheath. Nerve fascicles bound by perineurium adjacent to the tumour suggested the nerve of origin. The tumour cells were pleomorphic, showing a wavy fascicular pattern predominantly. The history of rapid growth, large size, an ulcerated overlying skin and microscopically cellular atypia with abundant necrosis and mitosis in the cellular areas of the tumour were in favour of a malignant tumour. No family history of Neurofibromatosis or history of pre-existing nerve sheath tumour was found. A diagnosis of MPNST was made based on morphology. Neural origin was confirmed by both microscopic and macroscopic identification of the nerve of origin.

Key Words :

Malignant Peripheral Nerve Sheath Tumour, Neurofibromatosis, Schwannoma, Neurofibroma, Spindle cell sarcoma, soft tissue sarcoma

Introduction :

Malignant Peripheral Nerve Sheath Tumour (MPNST) is a sarcoma of nerve sheath cells.[1] Previously it was called malignant Schwannoma or Neurofibroma, but due to inconsistent relation to benign Neurofibroma or Schwannoma and heterogeneity of the constituent cells, MPNST is the preferred term. Initially, for diagnosis, it was believed that one of the following criteria was needed, namely 1) origin from a pre-existing benign nerve sheath tumour or 2) ultrastructure of the tumour cells should show Schwann cell differentiation or 3) development of a spindle cell sarcoma in a case of or with family history of Neurofibromatosis type 1(NF1). MPNST can, however, be diagnosed by morphology without these criteria as a number of cases have been documented to share reproducible morphology and histopathological features.[2]

The tumour may be sporadic or associated with the presence of, or with family history of, NF1.[3-9] The age range is wide though most cases occur in adults. Sporadic cases are seen equally in both sexes and peak incidence is in the fifth decade. For those with NF1, the peak is 10-15 years lower and the prevalence is higher in males.

The site of occurrence is wide; limbs are more common than trunk and retroperitoneum. Least commonly it arises in the head and neck.[10]

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Tumours associated with NF1 more often show clear evidence of origin from a Neurofibroma or a nerve. Rarely, the tumour arises from benign Schwannoma.[11,12] 10% of MPNST appear to be secondary to radiation.[9,13] A small proportion of the patients are children and MPNST associated with NF1 is commoner in them than in the adult population.[14,15]

The overall 5 years survival is 30-50% due to higher prevalence of high grade tumour.[6-9] The prognosis is worse in MPNST associated with NF1. Death is mostly due to pulmonary metastasis.

A case of MPNST is presented here. According to clinical information, there was no family history of NF1. The patient did not have any clinical features of NF1 syndrome either. There was no pre-existing benign Schwannoma or Neurofibroma. The diagnosis was made by histopathological examination. Neural origin was confirmed by identification of the nerve of origin by gross and microscopic examination of the excised tumour. A thorough knowledge of the morphology of MPNST is essential for a prompt diagnosis and appropriate management of the patients. This forms the basis of the case report discussed here.

Case Report :

An 83 years old male presented to the Department of Surgery in first week of January, 2021, with an ulceratedsoft tissue mass over his right forearm. The mass first appeared 5 months previously, was painless and rapidly grew in size with involvement and ulceration of the overlying skin. There was no muscle weakness or swelling distal to it. No evidence of metastasis to other sites was found on imaging studies.

On examination, the margin was ill defined with an infiltrative nature. The size was 10 cm by 15 cm. The surface was variegated and bosselated in appearance. Venous engorgement was seen proximal to it and it bled to touch. On Magnetic Resonance Imaging, a huge, lobulated, infiltrative, soft tissue mass was seen to involve the subcutaneous tissue of palmer aspect of right forearm. There were focal haemorrhages, and no intramuscular invasion was seen. The underlying parts of the radius and ulna were found free of the tumour. There was no intraarticular extension. Based on these clinical and radiological findings, a diagnosis of soft tissue sarcoma was made.

The patient underwent wide local excision and closure of the wound with a split thickness skin graft. The excised mass was sent toour department for histopathological examination.

Macroscopic features : A grey white ulceroproliferative mass was received in the department of pathology. The mass had a rim of skin and as a whole measured 9.5cm × 8.5cm×3.5 cm. The Deep Resection Margin (DRM) was inked green. Grossly, there was a large area of friable tissue suggesting necrosis and one yellow area was alsonoted in the mass. Representative sections were made from different parts of the mass including mass with DRM, mass with skin and DRM, mass with focal yellow area and full cut surface of tumour.

Microscopy : Rapid growth and ulceroproliferative appearance, along with large size and a friable area of possible necrosis suggested a malignant lesion. Microscopy confirmed the malignant nature by showing a tumour of spindle cells growing in a pattern of nerve fascicle and surrounded by a connective tissue sheath. The tumour arose deep in the dermis and showed tightly packed spindle cells

in whorled, storiform and fascicular pattern. There was abundant necrosis, rapid transition of cellular zone to myxoid zone, areas of haemorrhage and zones with marked nuclear atypia (Fig 1).

In the zones of atypia, the tumour cells showed markedly pleomorphic nuclei (Fig 2) often bizarre in appearance and large; some nuclei were vesicular with macronucleoli and showed brisk mitotic activity. Many atypical mitotic figures were noted.

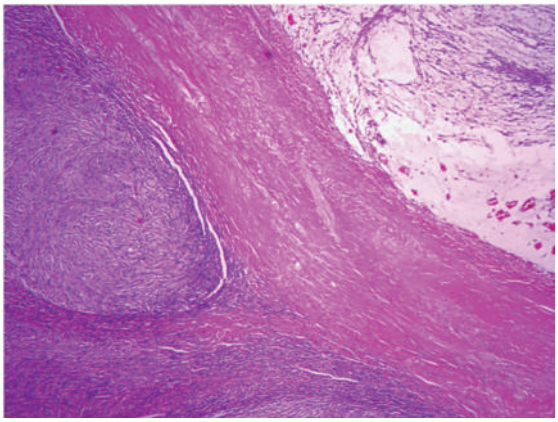

Fig. 1 : Tumour on the left with necrosis and myxoid area on the centre and right side respectively. (Magnification 4×)

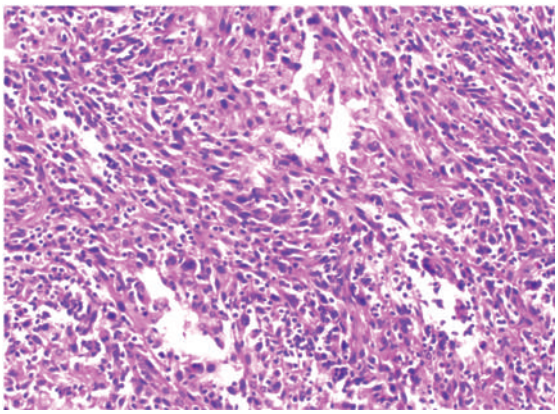

Fig. 2 : Higher magnification (20×) showing pleomorphic spindle cells with wavy pattern of growth and some multinucleated cells.

In some areas structures were seen which were suggestive of fascicles of peripheral nerve. Section from the yellow zone showed area of extensive coagulative necrosis. The DRM was involved by the tumour. These features suggested a high-grade spindle cell sarcoma and morphology and cytologic features suggested MPNST. At this point the specimen was again reviewed for identification of the nerve of origin and a white structure was noted adjacent to the growth. Sections were taken from that area, presuming the white structure to be the nerve of origin. Microscopy confirmed the presence of the nerve by showing fascicles of nerve fibres adjacent to the tumour and also structures of degenerated nerve fascicles within the tumour. [Fig. 3]

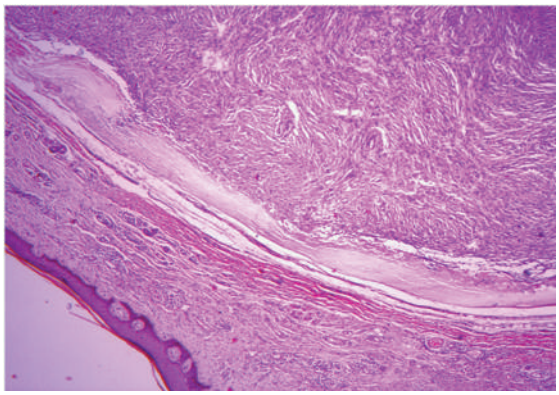

Fig. 3 : Tumour growing deep in dermis, in a pattern of nerve fascicle. It showed a capsule focally separating it from the uninvolved overlying skin (Magnification 4×)

On this basis,a histopathological diagnosis of MPNST was made. According to FNCLCC (Federation Nationale des Centres de LutteContre Le Cancer) grading system[1,16,17] the tumour was of Grade 3. It measured 9.5cm (>5 cm but <10cm) in maximum dimension. So TNM staging of stage pT2NxM0 was made according to the AJCC (American Joint Committee on Cancer)

staging system of soft tissue sarcoma of extremities or trunk.[18]

Discussion :

The majority of cases of MPNST present in the adult population.[1] The tumour shows a proliferation of malignant spindled cells that resemble closely Schwann cells. Previously either origin from a peripheral nerve or benign nerve sheath tumour, or occurrence of the neoplasm in von Recklinghausen disease or ultrastructural evidence of tumour cells having Schwann cell differentiation was required for diagnosis. It can be diagnosed by morphology alone in absence of these criteria, especially if supported by immunohistochemistry.[1,2] Most cases are large at presentation (often > 10 cm) unless they cause significant neurologic symptoms. This complication is rare, and large size of the growth shows their usual deep location. Tumour arising in a large peripheral nerve may show thefusiform swelling of the nerve, and when arising from a benign tumour macroscopically zoned appearance may be seen.

Histologically most cases show proliferation of spindle cells in a fascicular pattern. Often the tumour cells grow and show a whorled pattern around thin walled blood vessels, sometimes the growth of tumour cells extends directly in the blood vessel wall. These features are called perivascular accentuation and infiltration of vessel wall respectively. Prominent myxoid stroma with abundant hyaluronidase sensitive acidic mucopolysaccharides and abrupt transition of cellular zone to myxoid zones are seen.[1,3] These features suggest neural origin of the neoplasm.

Some cases show cellular and fascicular pattern throughout and are indistinguishable from monophasic synovial sarcoma in routine Haematoxylin and Eosin stained sections. However synovial sarcoma is more pleomorphic and angrier looking in high power view than this tumour. Up to 10% of tumours have abundant myxoid stroma; they are called myxoid MPNST. Cellswith pale poorly defined cytoplasm and nuclei with narrowtapering outline with a buckled configuration suggest the diagnosis of MPNST rather than myxoma. On the other hand a cellular or atypical neurofibroma especially in a case of NF1, may resemble MPNST where mitotic count decides the differentiation of benign atypical neurofibroma from malignancy. Most cases of MPNST show a high mitotic count. Nuclei are usually hyperchromatic and at least focally pleomorphic. Less commonly nuclear palisading is seen. A small proportion of MPNST are presumed to be perineural in origin; these show a very whorled growth pattern. Rarely MPNST may resemble undifferentiated pleomorphic sarcoma where ancillary techniques become essential for diagnosis. 10-15% of cases show heterologous differentiation.[19] Most commonly a rhabdomyosarcomatous component occurs, known as Triton tumour, that has a poor outcome. Other common heterologous components are osteosarcomatous and chondrosarcomatous differentiations. Immunohistochemically up to 40-50% of MPNSTs are S100 or SOX10 positive.[20,21] In those positive cases however, the proportion of S100 cells is often very less (<10-20%). Other markers also have poor reliability in diagnosis, owing to heterogeneity of the differentiation of component cells. Epitheloid MPNST occurs in less than 5% cases[22-25] and clinically behave the same as the usual type MPNST. Histopathologically it shows nests or chords of round cells with eosinophilic or amphophilic cytoplasm and vesicular nucleus

with prominent nucleolus. It resembles amelanotic melanoma in morphology. Absence of origin from the dermoepidermal junction, presence of the usual spindle cells in some foci, relatively uniform cytology and negativity for melanoma biomarkers like HMB45, excludes melanoma including metastatic melanoma.

In this case, fascicular growth of spindle cells was seen originating from the dermis (Fig 3). The nuclei were wavy, resembling nuclei of Schwann cells and cells showed whorled storiform pattern in most areas. Macroscopically there were large areas of necrosis which was confirmed microscopically. Large areas of coagulative necrosis were also seen. There were zones of nuclear atypia showing marked nuclear pleomorphism (Fig. 4 and 5) and high mitotic count (about 14-18 mitoses/10 high power field) (Fig. 4). The nerve of origin was identified macroscopically as a white structure adjacent to tutor mass. Microscopically presence of nerve fascicles with nerve fibres within perineural sheath confirmed the nerve oforigin. On this basis, by morphology, a histopathological diagnosis of MPNST was made.

By FNCLCC Grading system of soft tissue sarcomas[1,16,17], the tumour had a certain histologic type. So the tumour differentiation score was 2. Mitotic count was 10-14 /high power field, i.e., between 10-19 mitoses/10 high power field. Hence mitotic count score was 2. Tumour necrosis score was 2 as there was greater than 50% necrosis of the tumour area. So total score was 6 and tumour was of Grade 3.

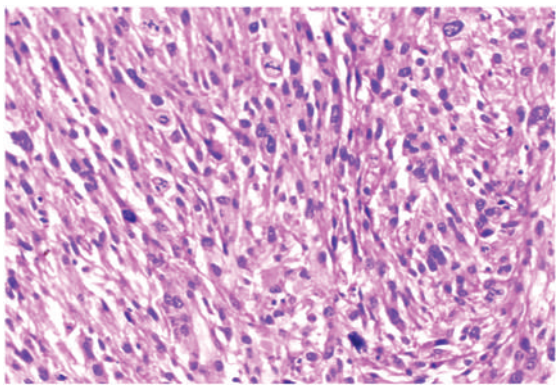

Fig. 4 : Photomicrograph shows pleomorphic cells with numerous atypical mitoses (Magnification 20×)

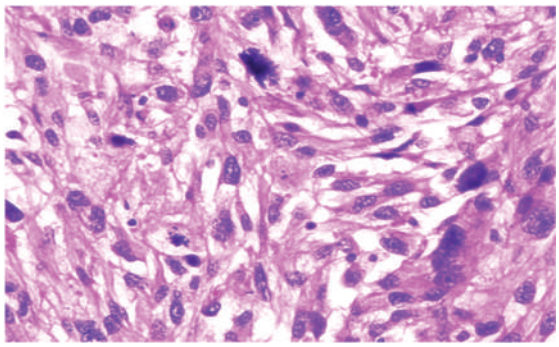

Fig. 5 : Higher magnification shows bizarre nuclei and marked pleomorphism (Magnification 100×)

In conclusion, MPNST is a malignant neoplasm of peripheral nerve sheath which may present clinically as a rapidly growing sarcoma arising from soft tissue. Prognosis is generally not good due to high prevalence of high grade tumours. An appropriate diagnosis is often possible by morphology along with clinical and radiologic correlation. The correct histopathological diagnosis is crucial for management and follow up of the patient and prognostication.

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Review Article

Endoscopic Trans-orbital Surgery : A Review

Shaoni Sanyal[1], Ranjan Raychowdhury[2]

Abstract :

Transorbital neuroendoscopic surgery (TONES), is an evolving minimally invasive endoscopic surgical to access the orbit as well as skull base. Traditional approach via the nasal corridor restricts access to the central portion of anterior skull base, but access to the lateral third of the anterior cranial fossa is not possible via this approach. The improved visualization provided by endoscopes has led to understanding the anatomy of the orbit in a different light and appreciate the structures of the orbit which aid as landmarks during trans-orbital procedures. A combination of approaches may be used for multi-portal surgery to deal with complex pathologies.

Key words :

Transorbital, Retrocanthal, Neurosurgery, Cranial Fossa, Optic Nerve

Introduction :

Endoscopic trans-orbital surgery is a rapidly evolving new multidisciplinary field spanning the specialties of Otolaryngology, Ophthalmology and Neurosurgery.

The techniques used for endoscopic access of the entire orbit and optic nerve, adjacent portions of the anterior skull base, the middle cranial fossa, and the intracranial space are called orbital endoscopicsurgery, transorbital endoscopic surgery, and transorbitalneuroendoscopic surgery (TONES), respectively. These procedures fall within the minimally disruptive natural orifice translumenal endoscopic surgery approaches.[1]

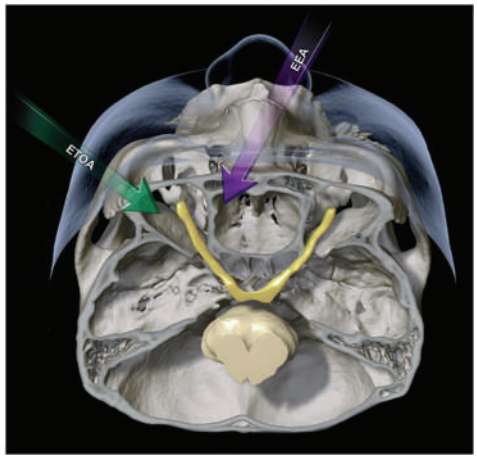

Fig. 1 : Trans-nasal vs trans-orbital approaches

Traditionally, the anterior skull base has been approached by the nasal corridor using a zero degree and a variety of angled endoscopes. The trans-nasal route and extended trans-nasal approaches provide access to the central portion of anterior and middle cranial fossa, but access to the lateral third of the anterior cranial fossa is not possible via this approach (Fig. 1).

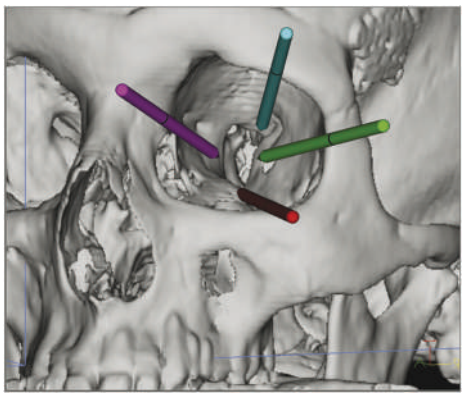

Fig. 2A : Access provided by trans-orbital endoscopic approaches

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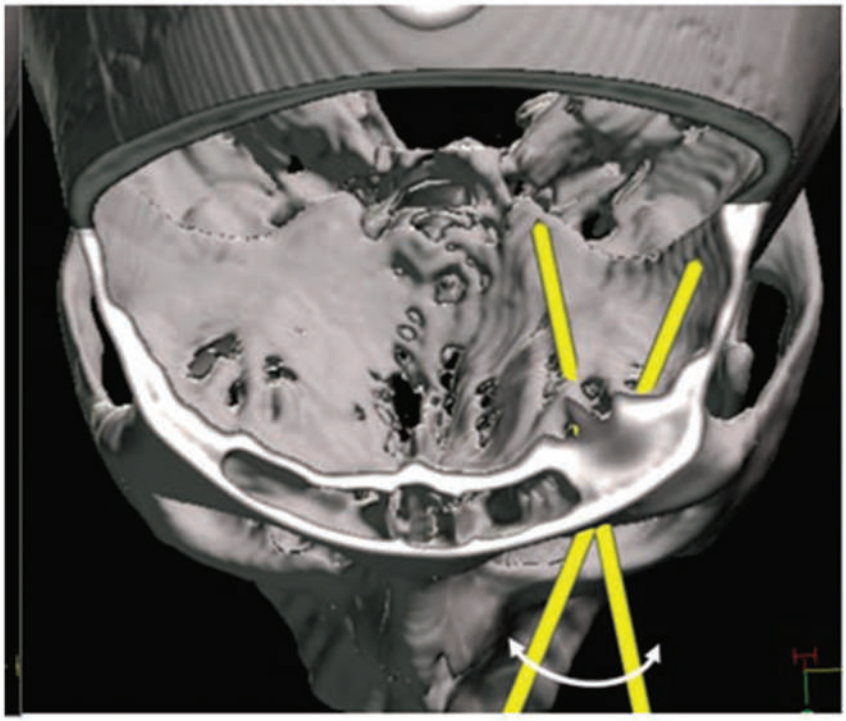

Fig. 2B : Access provided by trans-orbital endoscopic approaches

Trans-orbital endoscopic surgery isable to address a variety of clinical conditions such as space occupying lesions within the orbit, proptosis, epistaxis, and fracture of the orbital walls (Fig. 2A+2B). This technique not only provides access and improved visualisation; but is less morbid as compared to the traditional open approaches.

History :

From 1886 to 1940, the majority of Ophthalmic surgeons regarded the orbit as a deep, dark and bloody field with unrewarding surgical results.

Orbital tumor removal througha lower lid trans cutaneousroute was first described by Thomas Hope of Scotland in a young girl with preservation of the globe. Hope credited his mentor, the famous French ophthalmologist, St. Yves, as having first successfully performed suchan operation.[3]

Passavant was the first surgeon to perform lateral orbitotomy for an orbital vascular malformation. Independently, Kronlein popularized a method of lateralorbitotomy, performed by creating a crescent-shaped skin incision in the lateral side and extending superiorly towards the hairline and inferiorly towards the ear.[4]

In 1907, Rollet reported the first anterior orbitotomy,which involved making an incision beneath the brow anddissecting subperiosteally in order to gain entry to theorbit.[5]

Frontoethmoidal mucocele with proptosis wasmanaged by Lynch by placing incision in the superomedialorbital rim which extended from the supratrochlear regionto the medial canthal area. This incision, however, had complications like globe luxation into the nasal cavity, webbing of the medial canthal area,

lacrimal system injury and superioroblique tendon injury.[6]

In 2002 Lai et al. conducted a study where they used a trans-caruncular approach in order to remove frontoethmoidal mucoceles. The authors made an incision over the caruncle to reach the medial orbital wall periosteum and obtain a good exposure of the mucocele to removed them.[7]

In 2005 Nemet et al. described a "Lateral triangle flap technique", where the authors made an upper eyelid skin crease incision and a skin incision from the lateral canthal angle. The incisions were joined laterally just beyond the lateral orbital margin. The triangular skin muscle flap was raised medially to obtain adequate exposure.[8]

A lateral retrocanthal, minimally invasive, canthus sparing approach was published by Moe et al in 2007. The authors initially conducted a cadaver study to develop the surgical technique in order to reach the orbital floor and roof without effecting the structural integrity of the eyelid support system. They performed the technique on 30 patients and found this procedure was safe and provided a rapid access to the lateral orbit with ample exposure. They also added that this incision could be extended in a single continuous incision to the medial orbit.[9]

The same team, from the University of Washington, were among the first to successfully use transorbital portals to manage lesions involving the orbit, the anterior skull base and middle cranial fossa.

Pillai et al. in 2008 described the trans conjunctival endoscopic approach to the optic nerve and the medial intraconal orbit using a 2.7 mm diameter rigid endoscopein 7 cadavers.

Technique :

Just as the nasal endoscope completely altered the paradigm for sinonasal surgery, it has revolutionized trans-orbital surgery. The improved visualization has led to reviewing the anatomy of the orbit in a different light and has helped appreciate the structures of the orbit which aid as landmarks during trans-orbital procedures. A good example of this is Horner's muscle – a little muscle in the medial aspect of the orbit that directs one to the anterior ethmoidal artery. The anatomy and function of this muscle was not appreciated by otolaryngologists when doing a Lynch-Howarth approach to the medial orbit.[2]

Four transorbital pathways allow access to the orbit for intraconal and extraconal lesions, the paranasal sinuses and intracranial tumours (Fig. 2A).[1, 11]

These pathways have been described as follows:

Lateral Retrocanthal Approach :

The most common approaches to the lateral orbit in use are the lateral brow, lateral blepharoplasty, and lateral canthotomy incisions. A disadvantage common to these approaches is visible scars, delayed wound healing, prolonged pain, wound dehiscence, canthal dystopia and lateral ectropion. These can be overcome by a lateral canthal sparing incision-the lateral retro-canthal approach. A transconjunctival incision is made posterior to the lateral canthal tendon. This allows full visualization of the medial aspect of the lateral orbital wall as far posterior as the orbital apex. The incision allows ample exposure for repairing fractures at the frontozygomatic suture. It also providesan excellent portal for orbital endoscopy of the lateral wall and floor for multiple indications ranging from biopsy to fracture repair. Furthermore, this approach can be joined inferiorly with a transconjunctival approach to the orbital floor, providing an extended approach

for visualization and repair of the orbital floor and lateral wall. It also avoids bony orbitotomy hence obviating the need for reconstruction of the orbital rim with mini plates. This approach can be used to treat sphenoid meningioma, biopsy tumours present in the orbit and repair orbital fracture.[9]

Medial Approach :

The caruncle is lateralized with forceps, and an incision made with scissors at the junction of the conjunctiva and skin immediately medial to the caruncle (Fig 3).

When making this incision, a plane is visible in the loose areolar tissue immediately deep to the medial canthal tendon.

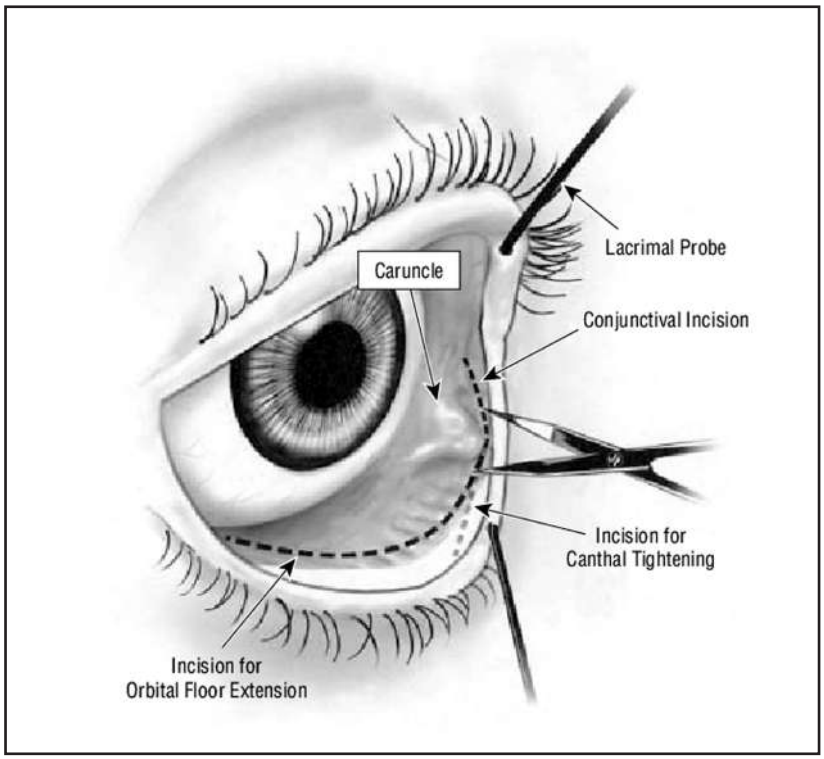

Fig. 3 : Precaruncular incision

The medial (precaruncular) portal provides easy, quick and safe access to the anterior and posterior ethmoidal arteries. For intractable epistaxis secondary to nasoethmoid fractures, this approach avoids an external incision and allows for quick recovery without the need for suturing the wound. A medial 180-degree optic nerve decompression can be performed by either an ophthalmologist trained in endoscopic techniques or by an endoscopic sinus surgeon. This approach can also be used for medial decompression in thyroid eye disease. The advantage of the precaruncular approach is the potential to preserve normal paranasal sinuses. A contralateral precaruncular approach gives excellent access for repair of a cerebrospinal fluid leak secondary to a Sternberg

canal defect in the lateral wall of a well-pneumatised sphenoid sinus. Even with the traditional transpterygoid approach, visualisation and manipulation of instruments in a very lateral defect can be difficult and palatal numbness is often a consequence of the surgery due to dissection through the pterygopalatine fossa. The contralateral precaruncular approach allows for direct visualisation of the defect using a zero-degree 4mm endoscope.

Inferior Approach :

The inferior approach is useful for blow-out fractures of the orbit, especially in cases where the extraocular muscles are entrapped. The transconjunctival incision is made onto the rim of the inferior orbit, a minimum of 2mm inferior to the tarsus. With the orbit deflected superiorly, the endoscope has a wide surgical pathway with structures such as the infraorbital canal being clearly visualised. Endoscopic visualisation allows for precise placements of grafts or plates to reconstruct the orbital floor.

Superior Approach :

This is excellent for superior extraconal lesions of the orbit including the lacrimal gland tumors. Superiorly there are two basic approaches, the lidcrease and the sub-brow incision. The upper eyelid skin crease incision starts from the puncta to the lateral canthus and then extends laterally along the laugh line without damaging the lateralcanthus to reach upto the zygomatic arch. The sub brow incision is curvilinear and parallel to the arch of the superior orbital rim and slightly below it.[12]

A combination of these approaches is used in multiportal surgery to access the anterior and middle cranial fossa.

Review of Literature :

Moe et al in 2007 developed the minimally invasive, lateralretrocanthal approach based on cadaveric dissections, and used this technique on 30 patients. The indications for surgery were: extensive fractures involving the lateral orbital wall, tumors requiring lateral orbitotomy for diagnosis or resection, and orbital wall defects requiring reconstruction after tumor excision. Of these 30 patients, the majority needed surgery for orbital fractures. The lateral retrocanthal approach provided adequate access to visualize the fractured segments and for placement of prosthesis. None of the usual complications of lateral approach was noted in this series of patients.[9]

In 2010 Moe et al extended this approach to deal with laterally placed anterior skull base lesions. Sixteen patients underwent twenty Trans-orbital Neuro Endoscopic (TONES) procedures for anterior skull base pathology, including repair of cerebrospinal leak, optic nerve decompression, repair of cranialbase fractures, and removal of skull base tumors. There were no significant complications or treatment failures in any of the procedures. The TONES approach provided up to 4 separate access ports with ample exposure for manipulation and correction of the pathology.[11]

Lubbe et al in 2016 operated on seven patients with sphenoid wing meningiomas. Spheno-orbital meningiomas are uncommon, complex, tumours characterised by hyperostosis of the sphenoid bone. The primary tumour arises from the dura of the sphenoid wing and enters the orbit through the optic canal or superior orbital fissure. The most common clinical manifestations are proptosis and visual loss due to progressive

invasion of the orbit and compression of the optic nerve. Surgical treatment is associated with significant morbidity. The patients had visual loss and proptosis secondary to sphenoid wing meningioma and were operated using the combined endoscopic transnasal and lateral orbitotomy approach. Five of seven patients had dramatic visual improvement, with one patient maintaining pre-operative visual acuity. The first optic nerve function to return was visual acuity. The five patients who showed improvement had an average 2.7 line increase in Snellenacuity by the sixth post-operative week.[13]

Conclusion :

Endoscopic transorbital surgery is rapidly evolving as a new development in the management of orbital and optic nerve pathology, as well as an access route to the adjacent anterior and middle skull base. It is to be hoped that this new approach may be made available at our Institute by interaction between the Departments of Ophthalmology and ENT Head & Neck Surgery for the benefit of our patients.

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Notice

The School of Biological Sciences at Ramakrishna Mission Seva Prathisthan

Ref.No.RMSP-VIMS/RKMVERI-JIVAN/2021 30 November 2021

NOTICE

to

The Faculty members, Doctors in general, Postgraduate students, Researchers and Nursing staff of Ramakrishna Mission Seva Pratishthan, Vivekananda Institute of Medical Sciences

All concerned are requested to kindly take note that with the approval of Ramakrishna Mission Seva Pratishthan Managing Committee, duly ratified and approved by the Apex Policymaking Body of Ramakrishna Mission, namely, Ramakrishna Mission Governing Body, Belur Math, a Centre for Research in Biological Sciences christened as JIVAN (Jiva-Vijnan-Anweshan-Niketan) has started functioning since January 2021. JIVAN is a research initiative of the School of Biological Sciences of Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI) Deemed University, in collaboration with Ramakrishna Mission Seva Pratishthan. Its objective is to bring together biological scientists with vast research experience in reputed Institutes and the medical doctors in order to create a synergy, taking on board eminent statisticians and computer scientists also to explore the fascinating emerging areas in the medical field. This Research Centre will thus promote what is now known as 'lab to bedside' 'translational' research, the current global trend.

Brief profile of JIVAN, Centre for Research in Biological Sciences:

On the sacred Tithipuja day of Holy Mother Sri Sarada Devi, 5 January 2021, the Research Centre on Biological Sciences, JIVAN (Jiva-Vijnan-Anweshan-Niketan) was inaugurated at Ramakrishna Mission Seva Pratishthan. The revered Trustees of Ramakrishna Math who are also the members of the Governing Body were kind enough to approve the formation of a Joint Implementation Committee comprising biological scientists from RKMVERI and medical doctors from Seva Pratishthan "to monitor and facilitate the various programmes and projects of the Research Unit JIVAN" at their meeting on 18 February 2021. This approval by the Trustees at Belur Math who are also the Governing Body members of Ramakrishna Mission is a great blessing for this new joint research venture, JIVAN.

The following five Working Groups have been formed to work out the details of the research, teaching-training, extension programmes that could be taken up under JIVAN keeping in view the expertise and infrastructure available with us.

1. **Working Group on Microbiology**

Prof Ruksana Choudhury (scientist, RKMVERI full-time professor) (Group Leader)
Dr Prabuddha Mukhopadhyay (Associate Professor, Dept. Of Medicine, RKMSPVIMS)
Dr Poulami Mukherjee (Assistant Professor, Dept. Of Microbiology, RKMSPVIMS)
Dr Pradeep Chakraborty (Professor & HOD, Dept. Of Medicine, RKMSPVIMS)

2. **Working Group on Cardiology & Metabolic Disorder**

Dr Soumitra Kumar (Professor & HOD, Dept. Of Cardiology, RKMSP) (Group Leader)
Dr Kunal Sikder (full-time Asst. Prof., RKMVERI)
Dr Ajitesh Roy (Associate Professor, Dept. Of Endocrinology, RKMSP)
Dr Rinini Dastidar (Professor, Dept. Of Biochemistry, RKMSP)
Dr Amit Kumar Mandal (doctor from Indian Inst of Sc. Education and Research, Kolkata)
Dr Tanmay Mahapatra (reputed doctor running a cohort and engaged in public health)

3. **Working Group on Hematology & Hemato-Oncology**

Dr Debasis Banerjee (Professor, RKMVERI & RKMSP) (Group Leader)
Dr Kunal Ray (scientist, RKMVERI full-time professor)
Prof Subrata Banerjee (scientist, RKMVERI full-time professor)
Prof Abhijit Chakrabarti (Professor, Saha Inst. Nuclear Physics, adjunct faculty, RKMVERI)
Dr H. Sudarshan (doctor-philanthropist, Padmashree awardee, engaged in public health, health education issues in rural and tribal areas)
Dr Debapriya Ghosh (full-time Asst. Prof., RKMVERI)

4. **Working Group on Neuroscience**

Dr Arkadeb Dutta (full-time Asst. Prof., RKMVERI) (Group Leader)
Dr Subhadip Paul (full-time Asst. Prof., RKMVERI)
Dr Sanjay Mohan Bhattacharya (Professor & HOD, Dept. Of General Surgery, RKMSPVIMS)
Dr Jayanta Roy (doctor, neuroscientist from Inst. of Neurosciences, Kolkata)

5. **Working Group on Medical Statistics and Digital Data Analytics**

Dr Nachiketa Chattopadhyay (Professor, Indian Stat Inst. Kolkata) (Group Leader)
Prof Probal Chaudhuri (Professor from Indian Statistical Inst., Kolkata)
Prof Debasis Sengupta (Professor from Indian Statistical Inst., Kolkata)
Prof Sarbani Palit (Professor from Indian Statistical Inst., Kolkata)

Despite the Covid-19 pandemic, the research activities in JIVAN involving both clinicians and scientists have slowly picked up momentum over a short period of less than a year. Research has been initiated on various projects for which three full-time faculty members of RKMVERI at the Asst. Professor level, with an excellent track record of research experience in prestigious and reputed research institutes abroad (USA, Europe, Israel, etc.) have been permanently posted at the JIVAN Centre at Seva Pratishthan with five research scholars, most of them with UGC/CSIR. DBT Junior Research Fellowships are presently working under them on various topics. A few more scholars are likely to join soon.

This Circular letter is to cordially invite the Faculty members, Doctors in general, Postgraduate students, Researchers and Nursing staff of Ramakrishna Mission Seva Pratishthan Vivekananda Institute of Medical Sciences interested in getting involved in any of the research activities under the JIVAN Research Centre to kindly submit their proposals to Swami Nityakamanandaji, Secretary of Ramakrishna Mission Seva Pratishthan Vivekananda Institute of Medical Sciences (rkmspsm@gmail.com) with copies to Swami Atmapriyanandaji, Pro-Chancellor of RKMVERI (atmapriyananda@gmail.com/rkmvu.ac.in) and to Dr. Debasis Banerjee, Convener-Coordinator, JIVAN (debasisbanerjee.rkmveri@gmail.com). The Joint Implementation Committee to "monitor and facilitate the various programmes and projects of the Research Unit JIVAN" will discuss and decide on viability of the proposals received. The proposals received by 31 December 2021 will be taken up for consideration by this Committee in early January 2022. Further proposals, if any, will be considered at later meetings of the Committee.

We are hopeful of receiving positive responses from all the stakeholders in this regard so that we may rejuvenate and revive the research activities of RKMSPVIMS and make it a vibrant research hub in Kolkata in the field of biomedical research. With kind regards,

Yours in the service of humanity,

(Swami Nityakamananda)
Secretary, RMSP-VIMS