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Oncology Forum wishes its readers a safe and healthy life...

ॐ सर्वे भवन्तु सुखिनः सर्वे सन्तु निरामयाः।
सर्वे भद्राणि पश्यन्तु मा कश्चिद्दुःखभाग्भवेत। ॐ शान्तिः शान्तिः शान्तिः॥

May all sentient beings be at peace, may no one suffer from illness,
May all see what is auspicious, may no one suffer. Om peace, peace, peace.

सभी सुखी होवें, सभी रोगमुक्त रहें,
सभी मंगलमय घटनाओं के साक्षी बनें और किसी को भी दुःख का भागी न बनना पड़े। ॐ शांति शांति शांति॥

INSIDE THIS ISSUE:

SPECIAL POINTS OF INTEREST:

- **Prton therapy**
- **Pancreatic Tumors**
- **Pain Medicine**
- **Sciatic Tumour**

PROTON THERAPY

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Modern radiation techniques i.e. Intensity Modulated Radiotherapy (IMRT) and its variants, have allowed radiation oncologists to reduce the dose received by normal structures adjacent to the "Target". Head neck cancers were among the first disease subsites where this treatment technique was applied, and then recognised as the standard of care. It is also one of the few sites wherein the advantage of IMRT was elucidated in a Phase III study – the PARSPORT trial.

The evolution of IMRT, over the last 2 decades, now allows the radiation oncologist to address not just the risk of xerostomia, but also the risk of swallowing dysfunction, hearing impairment, taste impairment, cognitive dysfunction and other morbidity that may occur subsequent to treatment. Image guidance, advances in computerized planning software and linear accelerator hardware, as well as a deeper understanding of dose volume relationships, as evinced by QUANTEC guidelines, have contributed in this evolution.

A recent development in the evolving treatment of head neck cancers is proton therapy. Whileproton therapy has been available since the 1950s, the latest generation of proton therapy units, based on the pencil beam scanning technology, allow better

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conformality of the radiation dose to the target; this has lead to its application in head neck cancers.

The advantage of proton therapy arises from the unique physical properties of protons, which are positively charged particles, as compared to the electromagnetic waveform of X Rays. Due to the mass carried by the proton particle, it's passage through tissues is slowed down till it deposits all its energy at a particular depth; this energy peak is called the Bragg peak. This physical characteristic results in better sparing of tissues distal to the Bragg peak. This, in turn, has radiobiological advantages, in the form of a higher proportion of difficult-to-repair double strand DNA breaks, as compared to photon based therapy.

The radiobiological and physical advantages of proton therapy result in better outcomes of lesions adjacent to the base of skull, as well as slow growing lesions with a low alpha beta. The latter may be explained, for simplicity, as a measure of radio sensitivity; better outcomes have therefore been noted with proton therapy in paranasal sinus cancers and adenoid cystic cancers. It is also the basis of improved outcomes in the treatment of chordomas.

To review the most recent reports:In a recent study of 35 patients treated for adenoid cystic carcinoma, reported by Pelak et al [1], local control was 92.2% at 2 years, inoperability not being associated with a poorer outcome. Similarly, in a study of 64 patients of sino-nasal cancers, 20% with history of prior radiotherapy, reported by Pasalic et al [2], no late G3–4 neurologic physician assessed toxicity was observed,with a 3- year local control, disease-free survival, and overall survival rate of 88%, 76%, and 82%, respectively.

In addition to the above, the most exciting development has been the recognition of the role of proton therapy in reducing treatment related morbidity in head neck cancers. A number of dosimetric studies indicate that both the integral dose received by the body as well as the dose received by individual organs is less in proton therapy. Additionally, a number of clinical studies also elucidate this. The MD Anderson Cancer Center reported on a prospective cohort study comprising 35 patients with oropharyngeal cancer (OPC) treated with proton therapy and 46 OPC patients treated with IMRT, both groups receiving concurrent cisplatin. Patient undergoing proton therapy were significantly less likely to requires gastrostomy tubes, 20% versus 48%[3]. In addition, they were also less likely to have taste and appetite issues post treatment. Similarly, Manzar et al[studied 46 IMPT and 259 VMATOPC patients and noted lower PEG placement, less hospitalization, less end of treatment opioid usage, reduced cough, dysgeusia, and better swallow in proton therapy patients.

This reduction in the dose received by organs at risk has a beneficial impact of the productivity of patients. In a multi-institutional trial of 188 patients were randomised to proton therapy versus IMRT and assessed for patient related work outcomes using the validated Work Productivity and Activity Impairment (WPAI) questionnaire. The proportion of patients who returned to/maintained work after treatment significantly increased over time, from 63%-78% (P=0.02) while this proportion was unchanged 48%-55% (P=0.58) in IMRT patients [5].

At Apollo Proton Cancer Centre, Chennai, head neck cancers constitute a fifth of patients undergoing proton therapy. Besides reirradiation, patients have undergone definitive and post-operative radiotherapy for paranasal sinus cancers, salivary gland cancers, oropharyngeal, nasopharyngeal, oral cavity and node positive laryngopharyngeal cancers. The outcomes have been consistent with those reported earlier, in addition to the observation that nasogastric tube feeding rates and treatment interruptions have remained consistently low, the latter even for elderly patients.
Some illustrative examples are as follows:

Patient A: 38 year old male, complained of growth in hard palate. On MRI PNS a polypoidal mass was noted involving hard palate, soft palate, extending to lateral walls of nasopharynx, oropharynx, tonsillar fossa, left tonsilloglossal sulcus and retromolar trigone. There was extension to left lower nasal cavity, left parapharyngeal space, left pterygopalatine fossa, left maxillary sinus, pterygomaxillary fissure, infratemporal fossa and inferior

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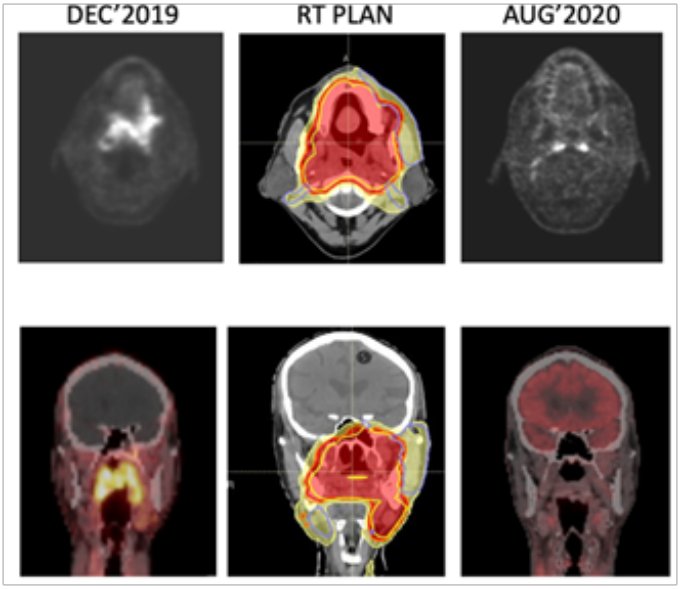
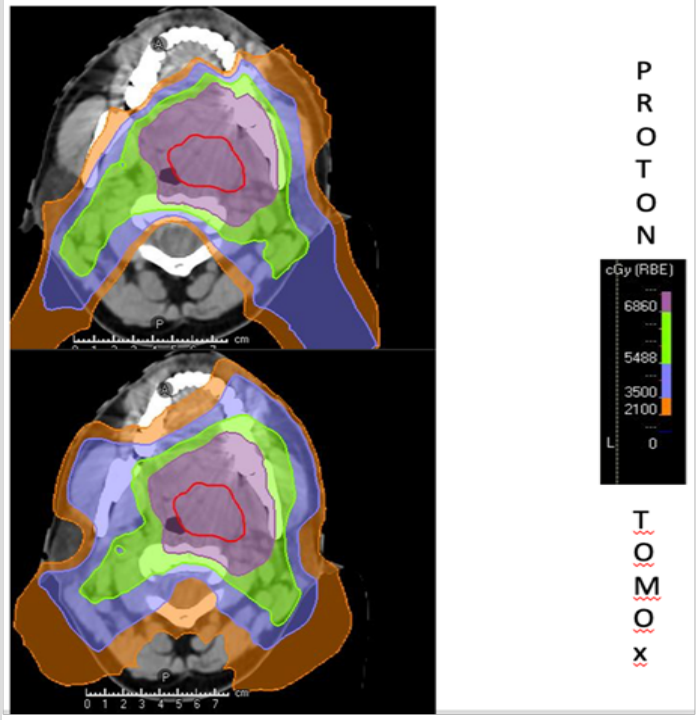
PROTON THERAPY

orbital fissure. There was destruction of hard palate, posteromedial wall of left maxillary sinus and left pterygoid process. Biopsy was reported as - Squamous cell carcinoma, Grade II, Stage- cT4bN2cM0

The patient underwent 2 cycles of TPF chemotherapy with partial response and was subsequently treated with a combination proton-photon plan, 70Gy in 35 fractions, with concurrent weekly cisplatin. He remains well 15 months following completion of treatment.





Patient B : 39 year old male, diagnosed with carcinoma left tonsil, biopsy was reported as moderately differentiated squamous cell carcinoma, keratinizing type p16-Positive.PETCT done showed increased uptake in left tonsil and left lateral wall of oropharynx of size 3x2.8x4cm (SUV 13) with minimal extension into left parapharyngeal space. Left level II node seen 2.6x2.4cm (SUV 12). On examination-Proliferative growth seen over left tonsil superiorly extending short of the base of uvula. Neck-Mobile left level II node 2x2 cm.

The patient underwent proton therapy, 70 Gy in 35 fractions, with concurrent chemotherapy. The dose to various mucosal structures viz., buccal mucosa, lips, larynx etc were 13 -49% less than a comparative Helical Tomotherapy plan. He remains well 14 months following completion of proton therapy.

Conclusion: Proton therapy limits dose to normal structures in patients undergoing treatment for head neck cancers. This allows for reduction in acute and late toxicity. In addition, in comparison to historical data, it is associated with better outcomes in paranasal sinus tumours and adenoid cystic cancers, compared to photon therapy.

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SCIATIC NOTCH DUMBBELL SHAPED TUMOR – COMBINED ANTERO-POSTERIOR APPROACH FOR EN-BLOC DISSECTION

Vedant Kabra

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Background

Soft tissue sarcomas (STS) are malignant neoplasms of mesenchymal origin[1]. Their heterogeneity and varied presentations have made it difficult to establish a consensus guideline for their management. Though they are treated with multimodal therapies, surgical intervention in form of monobloc resection with negative margins remains the standard of care[2].

Sciatic notch dumbbell shaped tumors (SNDT) pose a unique surgical challenge because of complex regional anatomy. Due to their rarity, descriptions of surgical techniques employed to resect SNDT are scarce. These tumors have poor prognosis because of high rates of local recurrence and surgical morbidity[3]. Here we describe the operative technique of resecting SNDT.

Case Presentation

Our patient was a 34 year old male who presented with pain in right knee and right foot drop. Clinical examination revealed an immobile mass in right gluteal region with right peroneal nerve palsy. He also had multiple neurofibromas present all over the body and their number had increased in last 4 years.

MRI revealed 13.4 x 7.9 x 5.8 cm mass in right piriformis muscle encasing right sciatic nerve, medially bulging into the pelvis and laterally crossing greater sciatic notch into gluteal area posterolateral to ilium and just superior to ischial spine. It was pushing the right internal iliac artery medially but not encasing or engulfing. It was starting just below the bifurcation of common iliac veins with internal iliac vein splayed over its anterior surface

Image guided transgluteal core biopsy and further immunohistochemistry revealed large epithelioid/ spindle tumor cells with complete loss of H3K27me3 expression, favouring diagnosis of malignant peripheral nerve sheath tumor (MPNST).

PET-CT done for staging confirmed it as localised disease. On the recommendation of institutional tumor board, patient was given 4 cycles of neoadjuvant chemotherapy and reassessed for surgery. Post chemotherapy, both MRI scan and PET-CT showed slight decrease in size with increase in necrotic component and significant decrease in metabolic activity on PET-CT. **(Figs 1 A-D)**

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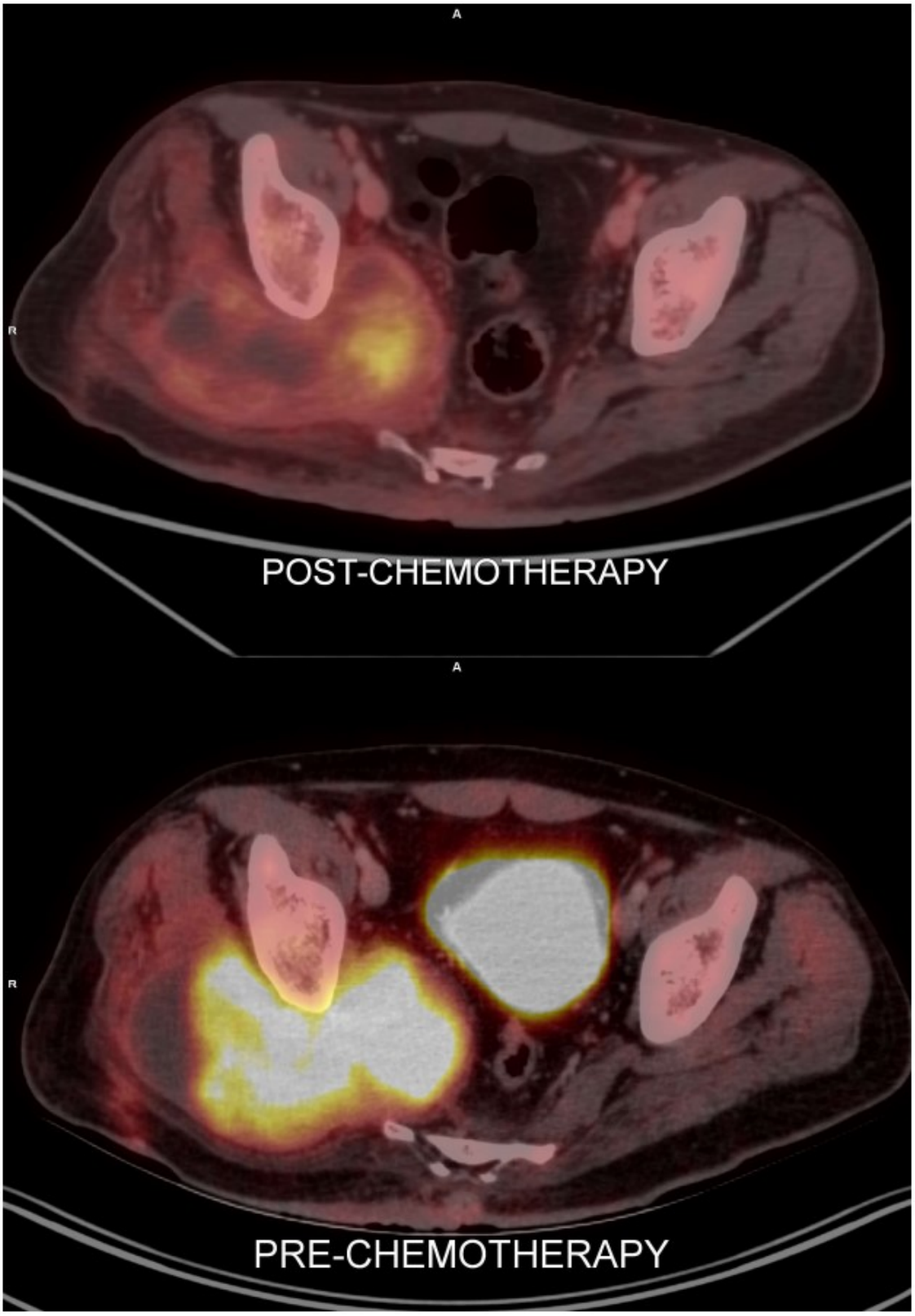
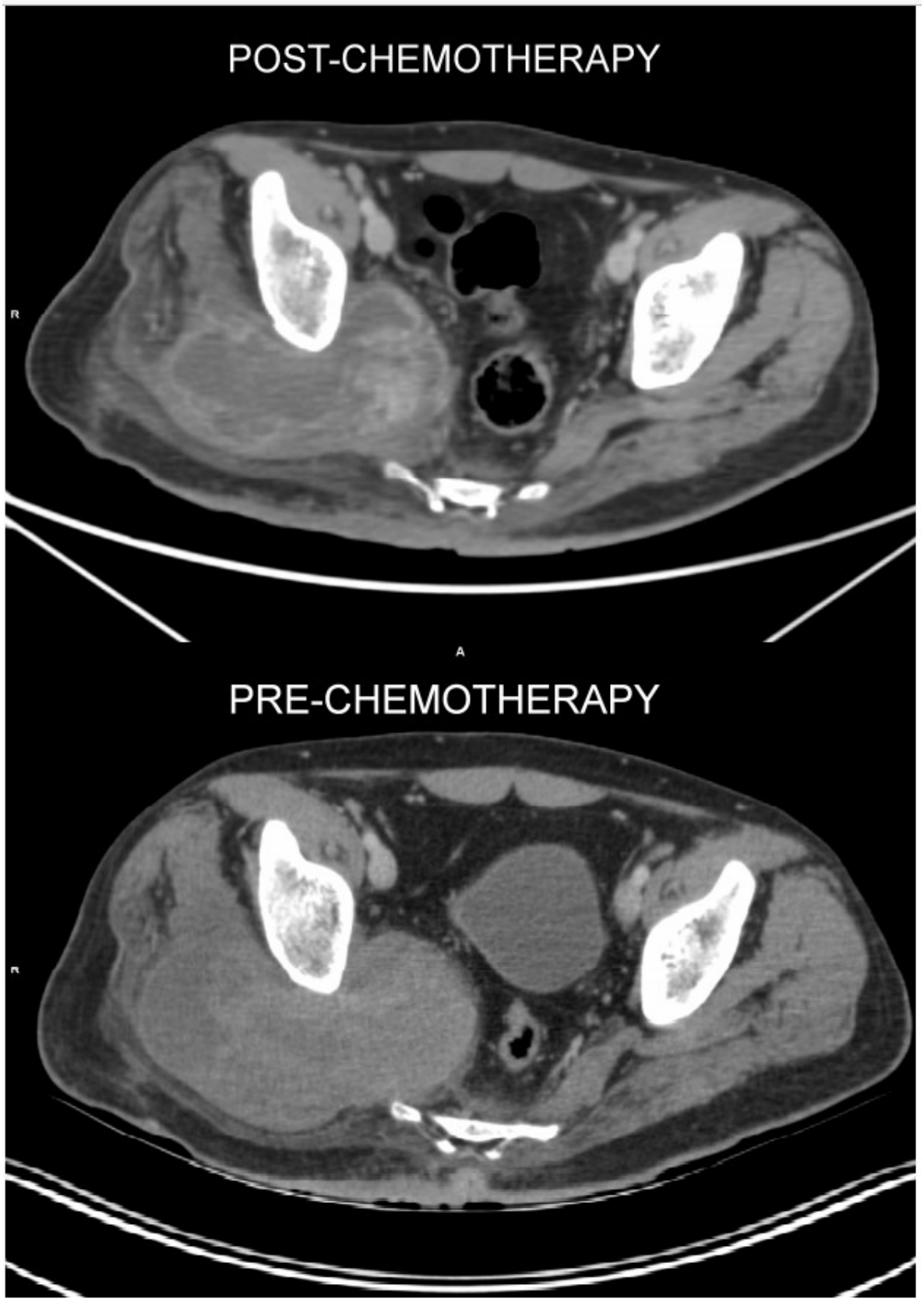
SCIATIC NOTCH DUMBBELL SHAPED TUMOR

PETCT images showing significant post chemo tumor necrosis (seen on CT images) and significant reduction in metabolic activity (fused PET-CT images)



Figures 1 A-D
Pre-chemo (Fig 1 C & D) and Post-chemo (Fig 1 A & B)

SCIATIC NOTCH DUMBBELL SHAPED TUMOR



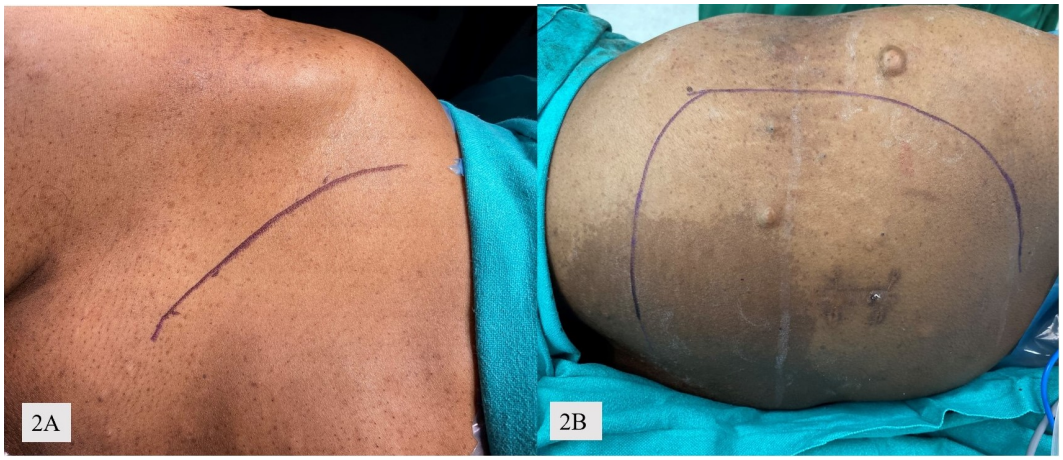
Figures 1 A-D
Pre-chemo (Fig 1 C & D) and Post-chemo (Fig 1 A & B)

SCIATIC NOTCH DUMBBELL SHAPED TUMOR

Surgical Technique

The main goal of surgery in STS resection is to achieve en-bloc resection with clear margins. Tumor capsule breach or piece meal resection leads to local contamination and increases the chances of local recurrence which is usually multi-centric and not amenable to curative resection[4]. As the tumor was encasing the sciatic nerve which was non-functional and infiltrating the gluteus maximus muscle on imaging, decision was made to sacrifice the nerve and completely excise the muscle to achieve optimal oncologic clearance.

We resected the tumor in one stage by using a combined anterior and posterior approach with patient in lateral decubitus position. We started with anterior approach by giving incision parallel to and above the inguinal ligament **(Fig. 2A)** entering the pelvic space retroperitoneally by pushing the peritoneum superomedially. The ureter and gonadal vessels were retracted medially. The internal iliac artery was exposed and lateral sacral, superior and inferior gluteal arteries ligated which significantly reduced the tumor blood supply. Internal iliac vein, which was splayed over the mass, was ligated just distal to its junction with external iliac vein. The obturator nerve was found stretched over the anterior surface of tumor and was dissected free and retracted. The tumor then was freed circumferentially, completely separating it from its pelvic attachments.



Figures 2A & B

Incision markings. A – Anterior incision parallel to & above inguinal ligament (Head end is to the right of picture); B – Posterior incision (Gluteal area; head end is to the left of picture)

For the posterior approach, incision was made beginning at the posterior aspect of the crest of the ilium, curving distally following the gluteus maximus muscle along the iliotibial band, passing over the greater trochanter. **(Fig 2B)** A fascio-cutaneous flap was raised to expose the entire gluteus maximus muscle which was then released from iliotibial band up to the iliac crest. Sciatic nerve identified at lower border of gluteus maximus muscle and divided. After the initial release from its insertion, muscle was then released from its origin along the para-sacral region from the coccyx to postero-inferior sacroiliac joint (PISIJ). Both the superior and inferior gluteal vessels are encountered in this part of dissection, however, their ligation at origin from internal iliac artery done during anterior approach makes their dissection easier and limits the blood loss[5]. **(Figs 3A & B).** The resected gluteus maximus muscle along with its contained tumor was then circumferentially freed from surrounding attachments. The specimen got delivered through the posterior incision by working through both anterior and posterior approach. **(Fig 4)** Suction drain was inserted and wounds were closed in layers.

SCIATIC NOTCH DUMBBELL SHAPED TUMOR

Figures 3A & B
Post excision operative field. A – Anterior view showing Bifurcation of common iliac artery & preserved internal iliac artery. The light is coming through sciatic notch. B – Posterior view

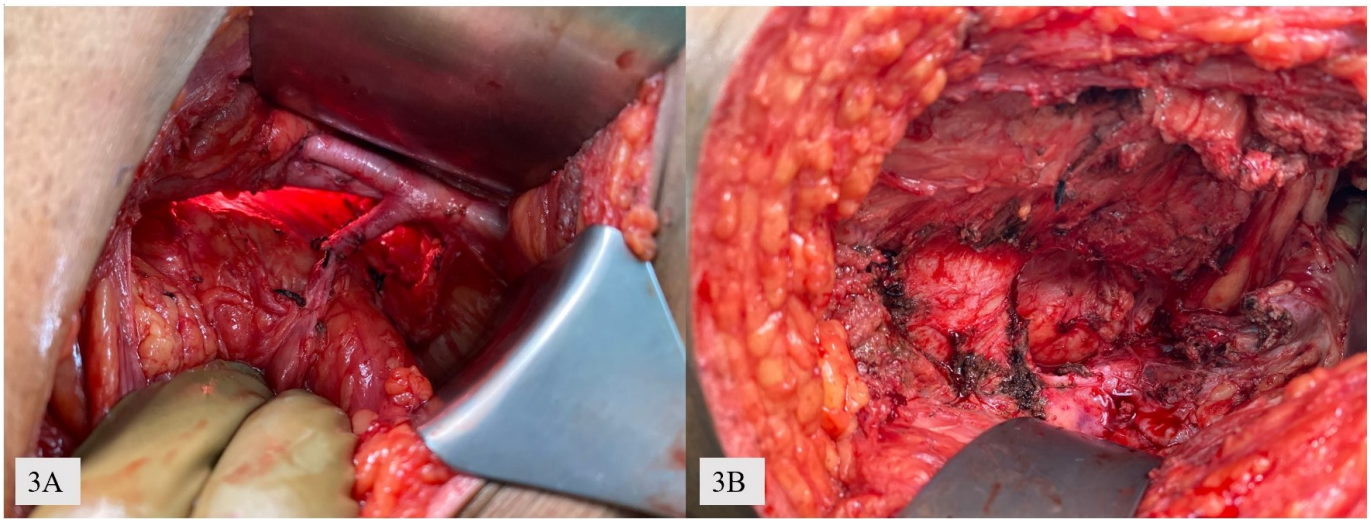
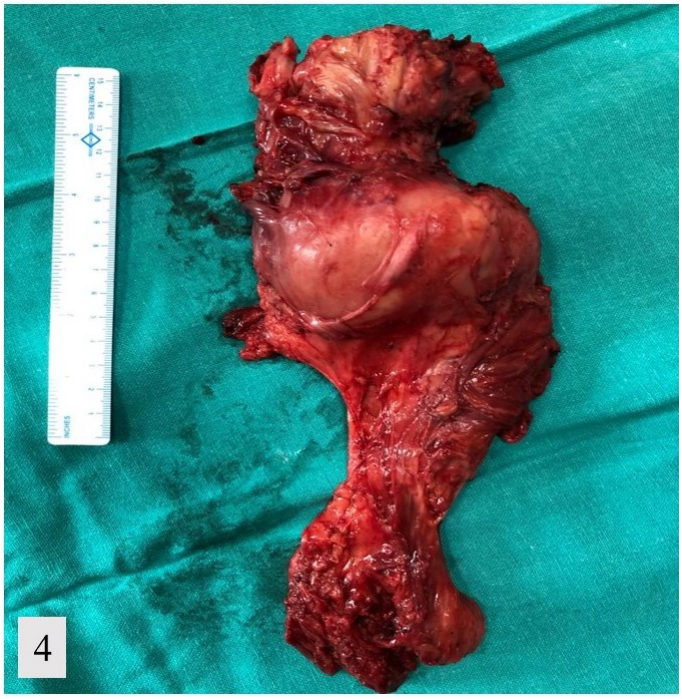


Figure 4
Specimen showing the dumbbell shaped tumor – upper part showing intrapelvic part and attached gluteal muscles in the lower part.



Discussion

SNDT have the capacity to grow large as the clinical symptoms produced are non-specific and patients present late[6]. Their relatively rare occurrence has made it difficult to perfect the surgical approach.

Surgical resection of SNDT requires a balance between adequate oncologic resection and preservation of function[7]. We performed a simultaneous anterior (retroperitoneal) and posterior approach, as described by Gaignard E et al, to limit inadvertent injury to surrounding organs as well as to have exposure from both sides[4]. Spinner RJ et al performed the dissection by transabdominal and transgluteal approach[3]. They went intraperitoneally first to complete intrapelvic dissection and then changed the position of patient for extra pelvic part. We went extraperitoneally in our anterior approach as it decreases the chances of intraperitoneal visceral injury and has early recovery of bowel function. Also our approach can be done in same lateral decubitus position saving the intraoperative time.

The role of good quality imaging is paramount in determining the pelvic arterial anastomotic networks and sciatic nerve in relation to the tumor. In our case, PET-CT showed the upper border of tumor a centimetre below the bifurcation of common iliac artery and abutting the bifurcation of common iliac vein. The sci-

atic nerve was completely encased in MRI scan. These anatomical relationships on multiple images allow surgeon to plan the course of surgery and in predicting outcomes. We ligated the lateral sacral, superior and inferior gluteal arteries first which helped in decreasing the tumor vascularity. This step done before mobilising the tumor decreases the blood loss. Though not in this case, sometimes ligation of internal iliac artery proper is also done when necessary but it can cause buttock claudication. Thus we painstakingly dissected the main internal iliac artery away from tumor carefully ligating all its branches going towards the tumor. Since MRI showed gluteus maximus muscle infiltration and its excision has little impact on the normal gait and pelvic stability, we excised it completely to achieve oncologic clearance.

We removed the tumor as monobloc specimen which is necessary to avoid local seeding. Here sciatic notch osteotomy was not required as we could deliver the tumor in posterior field through sciatic notch. Spinner et al suggested that it was not necessary to expand the sciatic notch to remove benign tumors and in one case they removed multiple masses in piecemeal fashion from pelvis[3]. In case of malignant tumors, we discourage such approach as tumor fragmentation increases the risk of local recurrence and becomes an indication for adjuvant radiotherapy[8]. MRI imaging also helps in determining whether sciatic notch osteotomies are required or not[9]. The division of sacrospinous and sacrotuberous ligaments provide more space for manipulation. However, marginal osteotomies may be required to enlarge the sciatic foramen. Li et al described C – shaped osteotomy during posterior approach with bone cutter preventing damage to hip and sacroiliac joint[10].

Conclusion

A combined anterior-posterior approach provides access to SNDTs from both sides and facilitates excision as single specimen. Thorough pre-operative work-up with adequate use of imaging guides in surgical planning. Retroperitoneal approach avoids disturbance from intraperitoneal organs and prevents any inadvertent injury to these organs also. Ligation of feeding vessels from internal iliac artery reduces intraoperative blood loss during posterior dissection. We also advocate expansion osteotomy if needed to deliver large mass through sciatic notch in one piece. The muscles infiltrated in gluteal region should be completely excised to ensure adequate margins and it appears to have little functional effect.

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We would like to thank Departments of Nuclear Medicine, Radiology and Histopathology for their help in evaluation and management of this patient

PANCREATIC TUMOURS

Dr Vinay Gaikwad , Surgical Oncologist, Paras Hospital, Gurugram

Humanity's fight against pancreatic cancer has been a gritty yet mostly disappointing one. With a multitude of modern advancements promising to help us gain some ground, the progress is yet sluggish. But positivity and persistence has seldom failed. We will, thus, remain tenacious and continue to be grateful for small but significant areas in which our patients are being better benefited.

This shy but potentially deadly organ, the pancreas, is snugly situated deep in our abdomen, right in front of the spine. When pancreatic cells multiply in an uncontrolled manner, tumors develop. They may arise from the exocrine cells (which produce juices to digest food) or the endocrine cells (which produce hormones that regulate blood sugar level, among other things). The classical cancers are adenocarcinomas which are usually exocrine. Neuroendocrine tumors generally originate from endocrine cells and are much better behaved, giving us many options to control or cure it. Other cystic tumors may also develop, but are usually benign and easier to treat.

The reason these dreaded tumors develop is not fully understood, but the cause is largely attributed to genetic mutations that happen inexplicably or those passed down in families. Pancreatitis, obesity, long-standing diabetes, and smoking contribute to the chances of developing this disease.

Pancreatic cancer is often detected late in its course because the symptoms are often vague. Significant pain or jaundice usually troubles the patient only after the tumor is more advanced. But once it has been suspected, imaging like CT scans or PET scans are used to accurately detect the diagnosis and stage. Endoscopic techniques may also be used for stenting or biopsy.

Surgery is still the only chance for cure, though it is not a possibility more often than not. Surgical results are improving without a doubt with excellent outcomes. Minimally invasive techniques have further decreased the morbidity. Chemotherapy, chemoradiation, or targeted therapy are options following surgery, or can be used for palliation if surgery is not possible.

Neuroendocrine tumors, on the other hand, are easier to cure or keep in check. Treatment options are also vaster. Surgery, somatostatin analogues, targeted therapy, peptide therapy, and liver targeted therapy are some of the treatment options.

We must tailor treatment according to the individual patient. It is therefore imperative that the management of pancreatic tumors be carried out in a specialized center with substantial expertise in this particular field. Early detection is rarely possible, so our focus remains on aggressive treatment and palliation. We will continue to battle this disease knowing well that we can not succeed until we have tried.

CASE REPORT

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My father was evaluated for lower urinary tract obstruction in 2008. I was in the final year of medical college then. So, I took Appa to my surgery professor, who did a digital rectal examination and felt a hard nodule on the prostate. The S.PSA level was within normal limits. Anyways, he did a biopsy, and the report showed atypical cells, no malignant cells. Because of the negative biopsy, he was kept on follow-up; furthermore, the urologist asked us to get the S. PSA level checked every 3 months.

I don't know how many of you can relate to this; it is challenging to get a test done by one's own parents. Doctor's parents are one of the most difficult to treat patients I have ever known. My father wasn't an exception. Reluctantly, after so much pushing and fighting over the phone (me in Delhi, he in Kerala), I got his serial PSA monitored every 3 months. We saw a very gradual increase in the values over the next 4 years.

In August 2012, when the PSA level just crossed the 4 mark level, we consulted the urologist again. I was a premature young radiation oncologist by then. I insisted on getting a re-biopsy done while the urologist opined against it. Now, you could guess how reluctant my father could have been in such a situation. When I put my foot down and insisted on a re-biopsy, my father almost reached the verge of disowning me.

So, I coaxed him through Amma; needless to say, he said yes. Anyways, he got his biopsy done, and sadly it showed adenocarcinoma.

More than a victorious feeling of 'see, I told you so,' I was upset. We all knew that prostate cancer is indolent; however, the cancer diagnosis scared the family. He was staged as T2 N0 M0. The debate then was to go for radiation or surgery. I acted impartially while counseling him regarding his treatment options, even though I was slightly biased towards my fraternity.

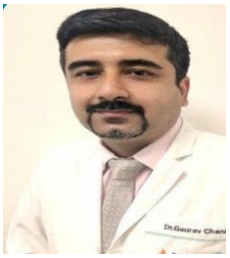
Nevertheless, he opted for surgery; he has to go against me, isn't that the rule? He underwent 'robotic prostatectomy' in September 2012. But, unfortunately, the histopathology report showed a 'positive' bladder base margin.

This led to another debate, whether to give adjuvant or salvage radiotherapy. According to the NCCN guidelines of 2012, adjuvant radiotherapy was indicated for margin-positive cases. So, he was advised to undergo adjuvant radiotherapy. He met the radiation oncologist in my hometown and fixed up a date to start radiotherapy. I still remember the starting date of radiation, 15th Feb 2013, the day after Valentine's Day. Everything was going according to plan until I got a call from my father. Over the phone, he sounded very severe and stern. 'I am not undergoing radiation,' he said. I said, 'okay, Appa.' He disconnected the call. Obviously, I felt sad, more so, for I was scared whether his disease would recur. I thought if I can't convince my own father, then how will I convince my patients.

Years went by; touchwood, Appa is alright now. He religiously does his PSA test every 3 months.
In 2020, Lancet published an article saying that there isn't much role for adjuvant radiotherapy in post-prostatectomy cases. This practice-changing article concluded that one should go only for salvage RT, no adjuvant RT. If Appa comes to know about this study, believe me, he will definitely disown me this time.

PS: Those who know my family and me, please shush. Please don't tell my father about this article.

STORY OF EVOLUTION OF PAIN MEDICINE



Dr Megha Pruthi, Dr Gaurav Chanana
Senior Consultant, Pain & Palliative Specialist ,
Max Institute of Cancer Care

History:

The word 'pain' is derived from the Latin word poena, which means "punishment" and word 'patient' is derived from the Latin word patior, meaning "to endure suffering or pain." [(1)] In early days pain was thought to be divine and treating it was met with resistance. [(2)] Aristotle hypothesized that heart was the center for processing of pain and it was only later that Stratton, Herophilus and Eistratus gave the concept that the brain was the site of pain perception as proposed by Plato earlier. [(1)] Pain was thought to be unimodal and managed haphazardly until Bonica, "The Father of Pain" realized the importance of pain management. [(1)] It is now a known fact that pain is a complex phenomenon, hence a physician who understands this and is equipped with specialized knowledge and skills to diagnose and manage these complex conditions is the need of the hour.

Everyone has one or more chronic pain conditions at some point in their lives. It is the most common reason why people seek medical care, and the most common cause of disability. Way back in 1990, Melzack pointed out that cancer patients suffer needless pain while >80 % of their pain can be well managed with appropriate knowledge. [(3)] But even 30 years after that mankind is still suffering. As per National Institutes of Health's National Center for Complementary and Integrative Health (NCCIH), almost 50 million American adults have significant chronic pain or severe pain. [(4)]

Why manage pain?

Chronic pain leads to multiple psychological issues including depression, anxiety, which in turn can be a cause of interpersonal problems, decreased productivity, unemployment, isolation, financial dependence, analgesics abuse, low self esteem with behavioral changes, thus affecting quality of life (QOL) & activities of daily living (ADL). [(5)] Poorly managed pain is also a major reason for dissatisfaction amongst patients. According to American pain society, 47% of patients with moderate to severe pain had changed physicians due to continued suffering (42%), inadequate knowledge of physician (31%), that the physician was not taking pain seriously enough (29%) or was unwilling to treat it aggressively (27%). [(5)]

Fig 1: Dr. John J Bonica, Father of Pain Medicine

Prevention of chronic pain is another aspect. Uncontrolled acute pain has multiple effects on physiology and psychology of patient, and might push him into the vicious cycle of chronic pain and psychological disturbances. [(6)]

Concept of Bio-psycho-social matrix:

According to ICD-10 pain is almost always attributable to an underlying pathophysiological mechanism, in whose absence or when psychological, and social factors seem to be contributing to a chronic pain presentation, ICD-10 offers only the option of "somatoform pain disorder." Advances in the understanding of psychological, social, and central nervous system mechanisms account for many inexplicable pain phenomena. In addition to nociceptive and neuropathic mechanisms, the concept of "nociplastic" was introduced as a third neurophysiological mechanism in some chronic pain conditions. However ICD 11 recognises chronic pain as a disease and it classifies chronic pain into as chronic primary pain and chronic secondary pain with its various subclassifications. [(7)]

STORY OF EVOLUTION OF PAIN MEDICINE

Changing our approach to pain management:

Understanding that pain management needs a multimodal approach.
Appropriate use of non pharmacological techniques including comfortable posture, elevation of limb, cold or hot packs, specialized physical therapy, TENS, relaxation therapy, and cognitive behavioral therapy.

Equipping ourselves with ever changing concepts of pain, so as to use our armamentarium of analgesics appropriately.

Use of complex drugs and appropriate use of interventional pain management by trained chronic pain physicians. Scope of interventional pain management spans from epidural steroid injections and facet blocks for back pain to spinal cord stimulators. Some of the commonly indicated interventions are:

Pain condition	*Intervention*
Herniated disc/ sciatica	Tranforaminal epidural and root sleeve block
Facet joint arthropathy	Facet joint injection/ medial branch block
Sacroiliitis	Sacro-iliac joint injection
Trigeminal neuralgia	Gasserian ganglion radio frequency ablation
Frozen Shoulder/rotator cuff injury Sport injuries Chronic tendonitis Partially torn tendons, ligaments and cartilage, knee and heel pains etc.	Ultrasound guided Platelet rich plasma (PRP) injection
Knee/ hip/ shoulder arthritis	Ultrasound guided prolotherapy/radio frequency ablation
Failed back surgery/ Post Spine surgery syndrome	Epidural adhesiolysis/ spinal cord stimulation
Cancer pain (intractable)	Coeliac plexus neurolysis, Splanchnic nerve RFA, Superior hypogastric plexus neurolysis Programable intrathecal implantable device
Myofascial pain	Myofascial release needling / trigger point injections
Peripheral vascular diseases	Stellate ganglion block, T2,T3 sympathectomy, lumbar sympathectomy,
Failed back surgery syndrome CRPS Peripheral/Diabetic Neuropathy Phantom pain Chronic Refractory Angina Cerebral Palsy	Spinal cord stimulator
Intractable Cancer Pain Spasticity Untreatable pain of any origin	Intrathecal drug delivery system
Compression/ metastatic vertebral fracture	Vertebroplasty/ Kyphoplasty

STORY OF EVOLUTION OF PAIN MEDICINE

Few Images depicting safety of these interventions done under image guidance with the use of radiological dyes. (Fig2,3). This has opened up a whole new branch of modern medicine and would continue to lure more and more medical students and doctors into the mysterious world of pain management in coming years. With use of special interventional skills and complete understanding of pain as a disease, liaisoning between pain physicians and other specialties would go a long way to provide a pain free life to our patients.

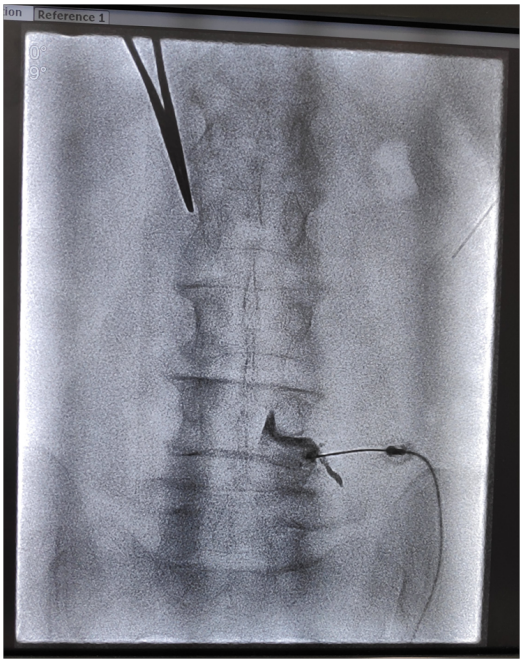


Fig 2: Transforaminal epidural steroid injection

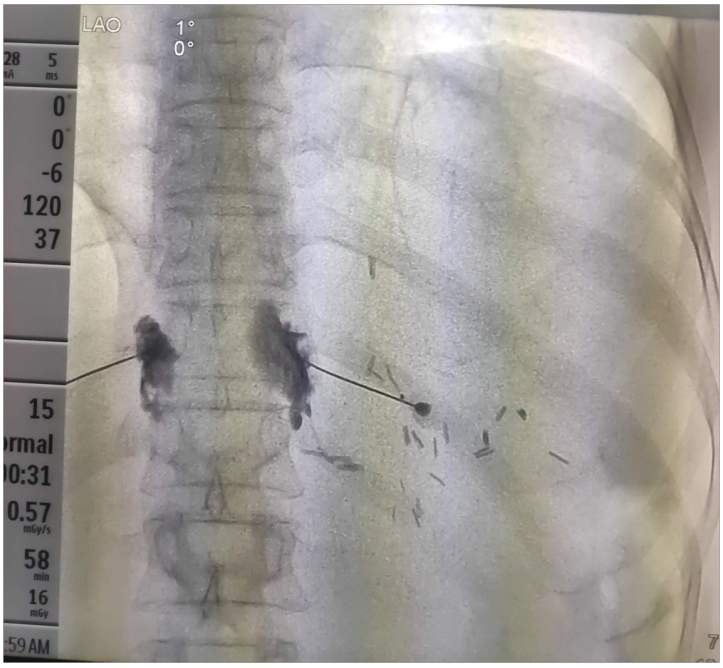


Fig 3: C Arm guided Splanchnic nerve block

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