Beyond Diagnostics: Exploring Interventional Radiology Breakthroughs

Maajid Mohi Ud Din Malik

Interventional radiology has grown from a diagnostic profession focused on medical imaging to a powerful therapeutic discipline that uses minimally invasive procedures to treat a wide range of medical diseases. Minimally invasive procedures, originally developed as an alternative to open surgery, are now favoured for many medical treatments. This fast-growing profession is testing medical practice with innovative methods that are improving patient outcomes. Interventional radiology uses fluoroscopy, ultrasonography, CT, or MRI to correctly administer therapies through small catheters and wires in incisions or body holes[1]. Unlike open operations, less invasive therapies cause less body disruption. Significant benefits include reduced trauma, scarring, healing time, hospital stays, and healthcare costs. Vascular diseases were initially treated using interventional radiology. Angioplasty and stent insertion are currently the standard initial treatment for peripheral artery disease. Endovascular methods now allow minimally invasive endograft placement to treat complex aortic aneurysms and dissections instead of surgical procedure. Many people have improved results and quality of life with minimally invasive alternatives. Interventional radiology is rapidly developing into interventional oncology. Image-guided therapies accurately administer drugs to tumours while protecting healthy cells. RFA, cryoablation, and microwave ablation use heat or freezing to remove can cerous tumours. The ideal treatment for liver tumours that cannot be operated on is RFA, which has similar survival rates to surgery but lower risk. Advances in technology make radioembolization more precise. This method targets and irradiates liver tumours from within using microscopic yttrium-90 particles[2]. These novel approaches are expanding treatment options for many hard-to-treat cancers.

Interventional radiology alters organ system therapies. Bronchial thermoplasty employs regulated radiofrequency radiation to treat severe asthma symptoms that don't respond to drugs. Primary and metastatic lung cancer treatments succeed with thermal ablation. Open surgery for complex renal cysts and modest renal tumours may be avoided with image-guided renal artery embolisation and ablation.

Sector neurointerventions are also improving. Interventional neuroradiologists can now reach exceedingly small brain blood arteries with microcatheter and microguidewire technologies. Minimally invasive treatments like coil embolisation are being used to treat previously difficult arteriovenous malformations and aneurysms. Thrombectomy devices have outperformed traditional medical therapy in treating ischemic strokes by enhancing recanalization and functional results[3]. These advances are revolutionising stroke treatment, a major cause of global mortality.

Interventional radiology is seeing more gastrointestinal applications. Transjugular intrahepatic portosystemic shunts (TIPS) cure portal hypertension complications such variceal haemorrhage nonsurgically. This is done by bypassing the hepatic and portal veins. Image-guided drainage and ablat-

Department of Radiology & Imaging Technology , Dr. D. Y. Patil School of Allied Health Sciences,

Correspondence Maajid Mohi Ud Din Malik
Department of Radiology & Imaging Technology, Dr Dy Patil Vidyapeeth , Pune MH, India
Email: majidmalik343@gmail.com
Date of Submission: 5th Feb 2024
Date of Revision: 2th May 2024
Date of Acceptance: 15th August 2024

ion are safer alternatives to surgery for pancreatic fluid accumulation and tumours. Percutaneous transhepatic biliary drainage reduces jaundice induced by biliary blockages when endoscopic techniques are not possible.

The field of urological interventions is likewise experiencing ongoing growth and expansion. Renal artery embolisation is a highly efficient therapy for managing uncontrollable bleeding caused by either trauma or tumours. Thermal ablation procedures are highly accurate in treating tiny renal tumours and are frequently used as alternatives to partial nephrectomy, while still preserving the nephrons. Focal therapies such as high-intensity focused ultrasound and cryoablation provide targeted therapy alternatives for prostate cancer. These therapies have the potential to maintain sexual function and urinary continence, unlike whole-gland treatments such as radiation or surgery[4]. These advancements are offering men a greater range of choices that are specifically designed for their unique cancer, anatomy, and priorities for quality of life.

Interventional radiology uses innovative technologies to lessen invasiveness and ensure a bright future. Robotics, AI, AR, and other digital innovations will boost accuracy, security, and results. Liquid embolics, drug-eluting microspheres, and other smart materials are expanding local therapeutic delivery. Hybrid operating rooms with many imaging modalities will improve minimally invasive image-guided surgery[5]. With continued developments, interventional radiology will change healthcare standards in numerous disciplines.

Impact on patients is significant. Compared to open surgeries, minimally invasive image-guided therapies reduce post-procedure pain, healing time, complications, and hospital stays. Numerous treatments can now be done outpatient or with a short overnight stay. This saves the US healthcare system billions of dollars annually. Importantly, these advances are improving and lengthening lives by safely treating previously untreatable diseases. Interventional radiology will increase patient quality of life worldwide as it advances.

Interventional radiology has revolutionised medical care using minimally invasive techniques. Image-guided therapies use small catheters and wires to accurately target specific areas using cutting-edge technology. These innovations are improving patient outcomes by reducing recovery time, complications, and costs compared to open surgery. The future is bright as the discipline uses digital advances to lessen invasiveness and expand applications. Interventional radiology will continue to advance medicine to enhance patient lives.

References:

1. Kaufman JA, & Bilbao J I (2016). Interventional radiology: A playmaker in modern medicine. American Journal of Roentgenology 2016;206(3):481-90. [DOI: 10.2214/AJR.15.15276].
2. Salem R, Lewandowski RJ, Mulcahy MF, Riaz A, Ryu RK, Ibrahim S, et al (2010). Radioembolization for hepatocellular carcinoma using Yttrium-90 microspheres: A comprehensive report of long-term outcomes. Gastroenterology 2010;138 (1):52–64. [DOI:10.1053/j.gastro.2009.09.006].
3. Mocco J, Zaidat OO, von Kummer R, Yoo A J, Christoforidis G A, Rasmussen P A, et al. (2016). Aspiration thrombectomy after intravenous alteplase versus intravenous alteplase alone. Stroke 2016;47(9):2338–44. DOI: [DOI: 10.1161/STROKEAHA.116.013516].
4. Ahmed H U, El-Shater Bosaily A, Brown L C, Gabe R, Kaplan R, Parmar M K, et al. (2017). Diagnostic accuracy of multi-parametric MRI and TRUS biopsy in prostate cancer (PROMIS): A paired validating confirmatory study. The Lancet 2017;389(10071):815–822. [DOI: 10.1016/S0140-6736(16)32401-1].
5. Jaffe TA, Ayala AG, Schurr M J, & Patel AR. (2013). The hybrid operating room: A solution for complex endovascular procedures. Seminars in Interventional Radiology 2013;30(4), 338-43. [DOI: 10.1055/s-0033-1358546].