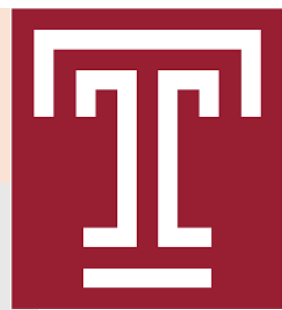




Common Measurements for Diagnosing Orthopedic Issues in the Radiology Emergency Room Setting in 2023



Rebecca Kalik¹, Mirza Baig MD², Daniel Edelman MD², Perry Gerard MD MBA FACR², Jared Meshekow, MD MPH¹

¹Temple University Hospital, Philadelphia, PA

²Westchester Medical Center, Valhalla NY

Background

Results

Conclusion

Orthopedic emergencies pose unique challenges in the emergency room, requiring prompt and precise diagnosis for effective treatment. Radiological assessments are indispensable in this process, providing critical insights into fractures, joint injuries, and soft tissue abnormalities. In the rapidly evolving landscape of radiology in 2023, understanding the common measurements and imaging modalities for orthopedic diagnosis is paramount for delivering high-quality patient care and optimizing outcomes.

Methods

- Incorporate advanced imaging modalities such as CT scans and MRI for detailed 3D visualization and comprehensive assessment of complex fractures, soft tissue injuries, ligament, tendon, and cartilage abnormalities.
- Combine multiple imaging modalities (X-ray, CT, and MRI) judiciously to leverage the strengths of each modality, enhance diagnostic accuracy, and ensure comprehensive evaluation of orthopedic conditions.
- Provide ongoing education and training for radiology professionals on the latest advancements in orthopedic imaging techniques, interpretation guidelines, and emerging technologies to stay abreast of best practices and ensure optimal patient care.

Common Orthopedic Measurements on MRI

Measurement	Application Area	Purpose
Anterior Cruciate Ligament (ACL) Length	Knee	Measures the length of the ACL to assess for tears or elongation.
Meniscal Extrusion	Knee	Measures how much the meniscus extends beyond the tibial plateau, indicating potential tears or degeneration.
Rotator Cuff Tear Size	Shoulder	Quantifies the size and extent of rotator cuff tears, critical for treatment planning.
Glenoid Version	Shoulder	Assesses the angle of the glenoid cavity for abnormalities, important for addressing shoulder instability and arthroplasty planning.
Cartilage Thickness	Knee, Hip, Ankle	Measures the thickness of articular cartilage, crucial for diagnosing osteoarthritis and assessing cartilage health.
Labral Tear Width and Length	Hip and Shoulder	Determines the size of labral tears, guiding treatment decisions.
Ankle Ligament Integrity	Ankle	Evaluates the condition of ankle ligaments, identifying possible tears or sprains.
Spinal Disc Height	Spine	Measures the height of intervertebral discs, vital for diagnosing disc degeneration or herniation.

Common Orthopedic Measurements on CT

Measurement	Application Area	Purpose
Femoral Anteversion Angle	Hip	Measures the rotational alignment of the femoral neck and condyles, crucial for diagnosing hip dysplasia and post-operative evaluations.
Tibial Torsion	Knee and Lower Leg	Assesses the axial alignment of the tibia, essential for correcting rotational deformities.
Acetabular Version Angle	Hip	Evaluates the orientation of the acetabulum, aiding in diagnosing hip dysplasia and planning hip replacement surgery.
Ganz Angle	Hip	Determines the spatial orientation of the acetabulum to assess femoral head coverage, vital in hip preservation surgery.
Spinal Canal Diameter	Spine	Measures the width of the spinal canal, key for diagnosing spinal stenosis.
Scoliosis Measurements	Spine	Utilizes 3D reconstructions to accurately assess spinal curvature and vertebral rotation in scoliosis.
Syndesmotic Width	Ankle	Measures the distance between the tibia and fibula at the ankle, crucial for diagnosing and treating dislocations and fractures.
Pedicle Width	Spine	Assesses the width of the vertebral pedicles for pre-surgical planning of spinal instrumentation.



Common Orthopedic Measurements on X-ray

Measurement	Application Area	Purpose
Center-Edge Angle of Wiberg	Hip	Evaluates acetabular coverage of the femoral head, crucial for diagnosing hip dysplasia.
Acetabular Index	Hip	Assesses the slope of the acetabular roof, helping in the evaluation of pediatric hip dysplasia.
Femorotibial Angle	Knee	Determines varus or valgus deformity by measuring the angle between the femur and tibia, critical for assessing knee alignment.
Patellar Alta	Knee	Evaluates the height of the patella relative to the femur, important for diagnosing patellofemoral disorders.
Cobb Angle	Spine	Measures the degree of spinal curvature in scoliosis, essential for treatment planning and monitoring progression.
Sagittal Balance	Spine	Assesses the overall alignment of the spine from the side, crucial for evaluating posture and planning spinal surgery.
Hallux Valgus Angle	Foot and Ankle	Measures the angle of the heel bone, used in the evaluation of bunions.
Calcaneal Pitch	Foot and Ankle	Assesses the angle of the heel bone, crucial for evaluating arch height and diagnosing flatfoot or high arch conditions.

The future of orthopedic diagnosis in the radiology emergency room setting hinges on a comprehensive understanding of common measurements and the strategic utilization of advanced imaging modalities. This depth of information guides treatment decisions and ensures patients receive the best care possible. Moving forward, ongoing education, embracing technology like AI, and fostering collaboration between healthcare teams will continue to improve patient outcomes. Radiology departments are key players in this journey, ensuring that every patient receives timely, accurate diagnoses and compassionate care. By embracing a multimodal approach and investing in continuous education, radiology departments can enhance diagnostic accuracy, optimize patient outcomes, and deliver exceptional care in 2023 and beyond.

References

- Hussain, S., Mubeen, I., Ullah, N., Shah, S. S., Khan, B. A., Zahoor, M., Ullah, R., Khan, F. A., & Sultan, M. A. (2022). Modern diagnostic imaging technique applications and risk factors in the medical field: A Review. *BioMed Research International*, 2022, 1–19. <https://doi.org/10.1155/2022/5164970>
- Mills, A. M., Raja, A. S., & Marin, J. R. (2015). Optimizing Diagnostic Imaging in the emergency department. *Academic Emergency Medicine*, 22(5), 625–631. <https://doi.org/10.1111/acem.12640>
- Raja, A. S., Ip, I. K., Sodickson, A. D., Walls, R. M., Seltzer, S. E., Kosowsky, J. M., & Khorasani, R. (2014). Radiology utilization in the Emergency Department: Trends of the past 2 decades. *American Journal of Roentgenology*, 203(2), 355–360. <https://doi.org/10.2214/ajr.13.11892>
- Walther, F., Eberlein-Gonska, M., Hoffmann, R.-T., Schmitt, J., & Blum, S. F. (2023). Measuring appropriateness of Diagnostic Imaging: A scoping review. *Insights into Imaging*, 14(1). <https://doi.org/10.1186/s13244-023-01409-6>