precisionos®

Orthopaedic Surgery Virtual Reality Curriculum

Humeral neck cut

App Name: Precision Connect

Focus of this Module:

This module provides trainees with an ability to practice a free-hand humeral neck cut for purposes of shoulder arthroplasty. Immediate metric feedback is given to the user on achieved neck shaft angle (NSA) and version. Providing consistent humeral cuts is an important surgical skill in both anatomic and reverse shoulder arthroplasty (RSA).

Applicability to ACGME Milestones 2.0:
ACGME Orthopaedic Sports Medicine

PGY Levels for this Module: PGY-3-5

Required training experiences included in this module:

- Simulator/VR training experiences in:
    - Clinical scenarios and decision making – understanding the effects of varying cut orientations and implant properties in anatomic and reverse shoulder arthroplasty
    - Operating room experience – positioning, exposure, and humeral neck cut in preparation for arthroplasty

Translation to core curriculum clinical experiences:

- Upper extremity/sports/advanced arthroplasty
    - Clinical decision making for proximal humerus preparation based on surgical indication and available implants
    - Operating experience in practicing humeral neck cuts to achieve desired NSA and version

	Milestones mapped to this module	Learning Modality
1.	PC1 History and Physical Examination, Imaging, Interpretation, and Diagnosis: To accurately assess the progression of a learners' skills as it pertains to patient history taking, physical examination, image interpretation and differential diagnosis generation Levels 1 (basic investigations) – 4 (independent interpretation of diagnostic imaging and treatment considerations)	Cognitive
2.	PC4 Open Surgical Skills: To develop knowledge and ability to perform open sports medicine surgical procedures independently Levels 1 (basic surgical skills) – 4 (independently performs complex procedures)	Cognitive Technical Skill
3.	MK1 Orthopaedic Clinical Decision Making: To analyze and synthesize medical knowledge to apply critical reasoning to clinical decision making, appropriately prioritizing diagnoses and using diagnostic tests Levels 1 (basic methodological reasoning) – 4 (efficiently synthesizes information to inform treatment plans)	Cognitive
4.	Practice-Based Learning and Improvement 1 (PBLI)1: To incorporate evidence and patient values into practice	Cognitive

	KEY GOALS FOR THIS MODULE	ACGME MILESTONES
✓	Describe the relevant surgical anatomy and deltopectoral approach for management of shoulder/ proximal humerus pathology	PC4/MK1: Level 1
✓	Describe the anatomy of the proximal humerus with respect to version and NSA. Describe various NSA and version options during reconstruction and how this contributes to stability, range of motion, and notching	MK1: Level 1
✓	Perform a proximal humeral neck cut to varying NSA and version options.	PC4: Level 2
✓	Apply knowledge gained in simulation to clinical scenarios of open shoulder surgery	PC4: Level 2
✓	Critically evaluate medical information and its sources as it relates to shoulder surgery patients	PBLI1: Level 3

ASSESSMENTS DURING MODULE	LOCATION/SOFTWARE
· Module completion tracking · Technical skill tracking using Precision Score	PrecisionOS VR and Online Dashboard

LEARNING CONTEXT	This module allows trainees to gain an understanding of humeral preparation in shoulder arthroplasty and the varying NSA and version options to achieve implant stability.

RELATIONSHIP TO ACGME	· Trauma · Sports · Upper Extremity
LEARNING OUTCOMES: GOALS/ OBJECTIVES	· **KNOW:** humeral anatomy and normal ranges of NSA and version · **KNOW:** how NSA and version can differ between anatomic TSA and RSA · **KNOW:** the relative indications and contraindications for total and reverse total shoulder arthroplasty · **DO:** apply knowledge to perform varying humeral cuts for anatomic TSA and RSA
SUPPLEMENTARY DOCUMENTS	Jassim SS, Ernstbrunner L, Ek ET. Does Humeral Component Version Affect Range of Motion and Clinical Outcomes in Reverse Total Shoulder Arthroplasty? A Systematic Review. J Clin Med. 2021 Dec 8;10(24):5745. doi: 10.3390/jcm10245745. PMID: 34945040; PMCID: PMC8703663.
SPECIFIC COMPETENCIES	· Develop a workup to patients with shoulder pathology including relevant imaging · Determine the appropriate humeral neck cut relative to implant selection
LEARNING/ TEACHING STRATEGIES	· Self-directed learning · Repetition, trial and error, and completion of VR module for augmented baseplate insertion · Multiplayer (host-directed) learning
EVALUATION METHOD OR TOOL	· Performance metrics are collected for each specific task (humeral neck cut with NSA, version, and resection amount) · Performance can be tracked individually over time to determine skill and improvement as well as by program directors for CBD purposes. · Current Proficiency Score: 48%

Additional reading:

1. Werner BS, Chaoui J, Walch G. The influence of humeral neck shaft angle and glenoid lateralization on range of motion in reverse shoulder arthroplasty. J Shoulder Elbow Surg. 2017 Oct;26(10):1726–1731. doi: 10.1016/j.jse.2017.03.032. Epub 2017 May 17. PMID: 28528016.
2. Kontaxis A, Chen X, Berhouet J, Choi D, Wright T, Dines DM, Warren RF, Gulotta LV. Humeral version in reverse shoulder arthroplasty affects impingement in activities of daily living. J Shoulder Elbow Surg. 2017 Jun;26(6):1073–1082. doi: 10.1016/j.jse.2016.11.052. Epub 2017 Feb 2. PMID: 28162877.
3. Nalbone L, Adelfio R, D'Arienzo M, Ingrassia T, Nigrelli V, Zabbara F, Paladini P, Campi F, Pellegrini A, Porcellini G. Optimal positioning of the humeral component in the reverse shoulder prosthesis. Musculoskelet Surg. 2014 Aug;98(2):135–42. doi: 10.1007/s12306-013-0274-z. Epub 2013 May 30. PMID: 23719768.
4. Aleem AW, Feeley BT, Austin LS, Ma CB, Krupp RJ, Ramsey ML, Getz CL. Effect of Humeral Component Version on Outcomes in Reverse Shoulder Arthroplasty. Orthopedics. 2017 May 1;40(3):179–186. doi: 10.3928/01477447-20170117-04. Epub 2017 Jan 23. PMID: 28112785.

About Us

PrecisionOS is a leading provider of virtual reality surgical training solutions for the medical industry. Our immersive platform enables universities and medical institutions to more effectively train medical residents and practicing surgeons while improving the transfer of knowledge and skills.

To learn more about us, visit us on our website.