¿Cuál es el método más fiable para medir el defecto óseo glenoideo en la inestabilidad glenohumeral anterior?

Estudio comparativo en cadáver de diferentes técnicas de medición

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Inestabilidad anterior de hombro y defecto óseo glenoideo

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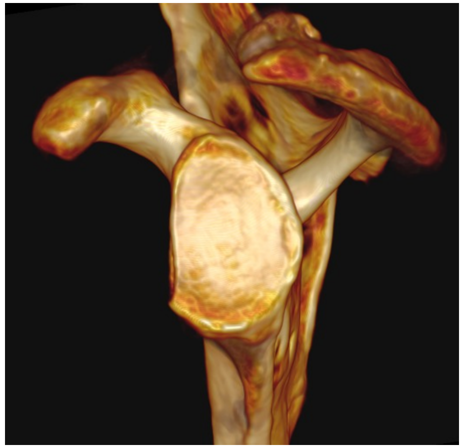
- Defecto óseo glenoideo es frecuente (hasta 90 %)
  - Agudo: Bankart óseo
  - Crónico: erosión gradual en inestabilidad recidivante
- Defecto óseo incrementa riesgo de recidiva → Omartrosis
- No todos los defectos óseos son iguales
- “Critical bone loss” para decisión quirúrgica
  - Bankart artroscópico
  - Bloque óseo



Qué es defecto óseo “crítico”

EVOLUCIÓN

- Inicialmente “crítico” >27%

- Evolución del concepto ”critical bone loss”
  - Desde 25% → 13.5%

The Inverted Pear Glenoid: An Indicator of Significant Glenoid Bone Loss

27%

Risk Fact... Shoul...

Effect of an Anterior Glenoid ...ability

Critical Value of Anterior Glenoid Bone Loss That Lead...

Contents lists available at ScienceDirect

Risk Factors for Recurrence After Arthroscopic Instability Repair—The Importance of Glenoid Bone Loss >15%,

17%

Redefining “Critical” Bone Loss in Shoulder Instability

Functional Outcomes Worsen With “Subcritical” Bone Loss

CPT James S. Shaha,*† MD, CPT Jay B. Cook,† MD, MAJ Daniel J. Song,† MD,
CDR Douglas J. Rowles,† MD, Craig R. Bottoni,† MD,
Steven H. Shaha,‡ PhD, DBA, and COL John M. Tokish,† MD
Investigation performed at Tripler Army Medical Center, Honolulu, Hawaii, USA

13.5%

Qué es defecto óseo “crítico”?

EVOLUCIÓN

- Cada estudio utiliza diferente metodología
    - Técnica de medición
    - Técnica de imagen
        - RM vs TC (2D vs 3D)
  - Resultados clínicos **NO son comparables**

VS.

VS.

VS.

Que es defecto óseo "crítico"?

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IMPLICACIONES IMPORTANTES

- Guía para la decisión quirúrgica
  - Quizás algunos casos no requieren una cirugía de Bloque óseo
  - Quizás algunos casos fracasaran inevitablemente con Bankart artroscópico

- Antes de determinar un punto de corte, es necesario un método Gold Standard

Fiable

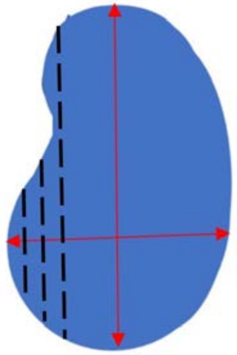
Consistente

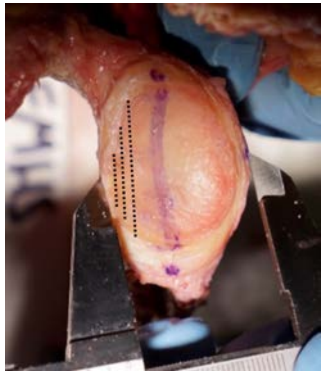
Exacta

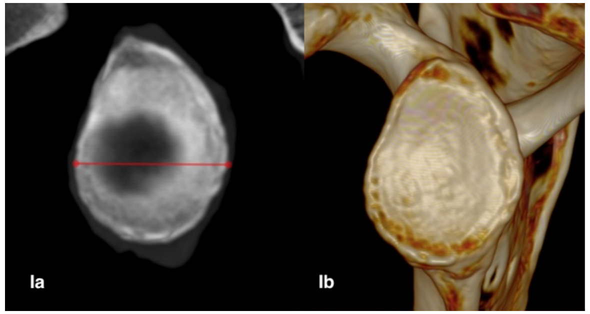
¿Cuál es el método más fiable para medir el defecto óseo glenoideo en la inestabilidad glenohumeral anterior?

¿Cuál es el método más fiable para medir el defecto óseo glenoideo en la inestabilidad glenohumeral anterior?

- **Objetivo:** identificar la técnica mas consistente y precisa para medición de defectos óseos glenoideos
- 6 glenas de cadáver con 3 defectos óseos incrementales= **18 muestras**
- Mediciones físicas de los defectos óseos (Control)
- TC proyección *"en face":* 2D y 3D
- 6 observadores: 3 experimentados and 3 menos experimentados
- 5 técnicas diferentes de medición
- Análisis de fiabilidad
  - Consistencia (ICC)
  - Exactitud

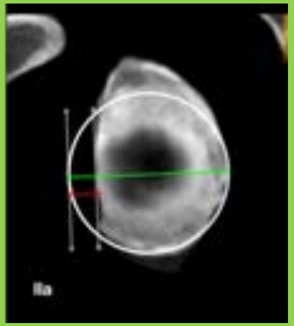
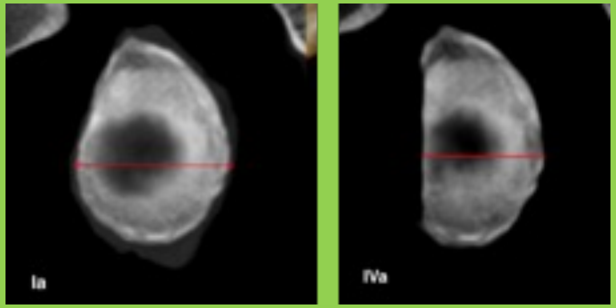






2D **3D**

Técnicas de medición de defecto óseo glenoideo

MEDICIONES LINEALES	MEDICIONES DE SUPERFICIE	MODELOS DE FORMA ESTADISTICOS
Método Shaha 	**Método Barchilon** 	**Método Giles** 
Método Griffith 	**Método PICO** 	

Resultados

CONSISTENCIA (CCI)

	Table: Intraclass correlation coefficient (95%CI)					
Surgeon Group	**Image**	**Barchilon**	**Giles**	**Griffith**	**PICO**	**Shaha**
More experienced	2D	0.878 (0.757, 0.948)	0.861 (0.725, 0.940)	0.827 (0.667, 0.925)	0.809 (0.637, 0.917)	0.651 (0.400, 0.836)
	3D	0.752 (0.546, 0.889)	0.795 (0.613, 0.910)	0.775 (0.582, 0.900)	0.809 (0.637, 0.917)	0.747 (0.538, 0.886)
	95%CI diff*	(-0.02, 0.27)	(-0.06, 0.21)	(-0.07, 0.13)	(-0.12, 0.12)	(-0.38, 0.17)
Less experienced	2D	0.394 (0.103, 0.677)	0.879 (0.757, 0.948)	0.641 (0.387, 0.831)	0.766 (0.567, 0.896)	0.538 (0.259, 0.771)
	3D	-0.018 (-0.234, 0.310)	0.672 (0.429, 0.847)	0.755 (0.550, 0.890)	0.755 (0.551, 0.890)	0.360 (0.070, 0.653)
	95%CI diff*	**(0.05, 0.76)**	**(0.03, 0.40)**	(-0.46, 0.19)	(-0.12, 0.15)	(-0.17, 0.40)
More vs Less	2D†	**(0.13, 0.82)**	(-0.14, 0.10)	(-0.07, 0.51)	(-0.10, 0.19)	(-0.22, 0.44)
More vs Less	3D†	**(0.41, 1.05)**	(-0.02, 0.29)	(-0.10, 0.19)	(-0.12, 0.26)	**(0.12, 0.66)**

Resultados

EXACTITUD

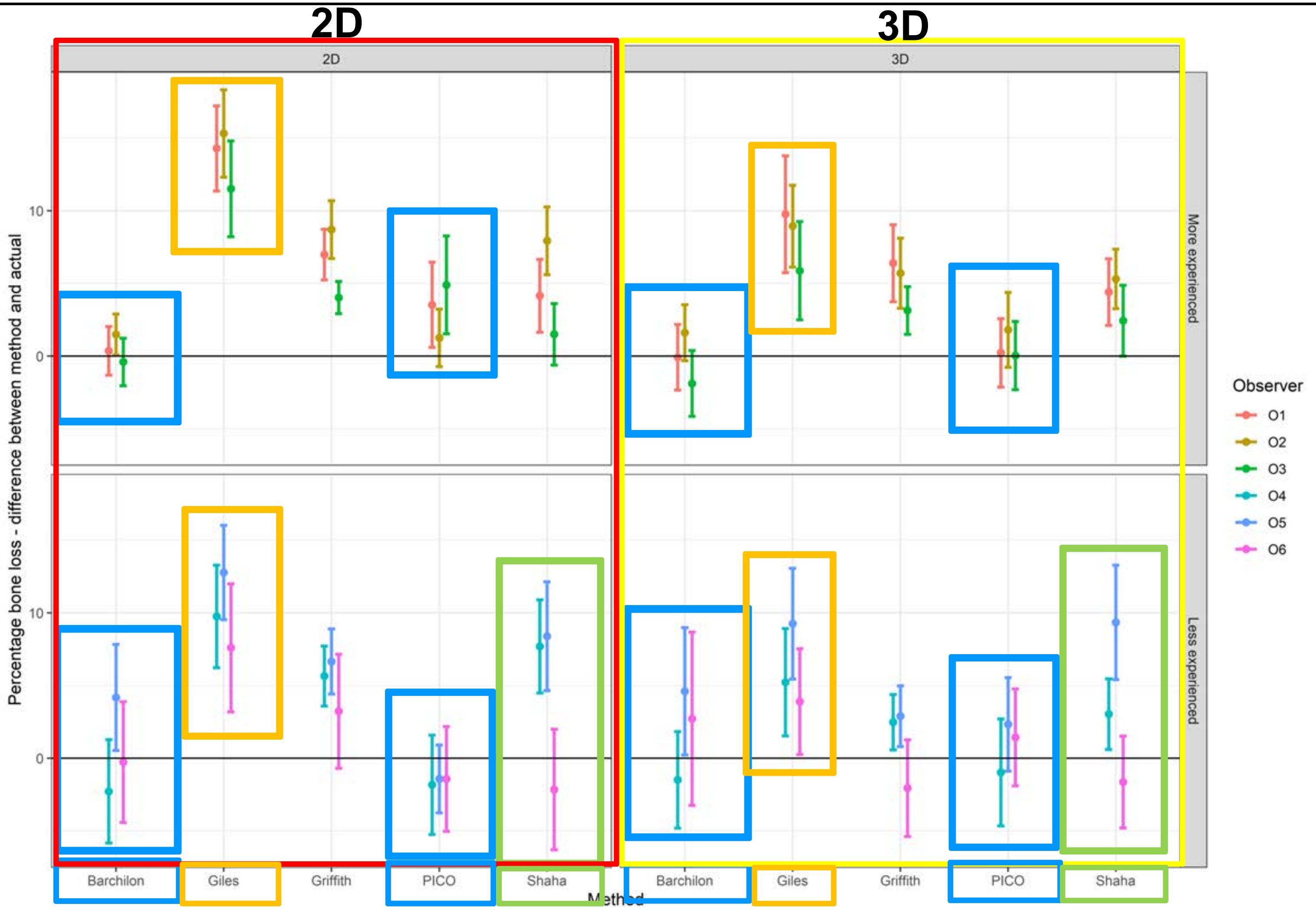
	Table: Accuracy - mean (SD) difference in bone loss % between each measurement technique and the control				
	Experienced observers				
2D	**Barchilon**	**Giles**	**Griffith**	**PICO**	**Shaha**
Mean (SD) p-value	0.49 (2.44) p=0.407	13.7 (5.72) p<0.001	6.58 (2.34) p<0.001	3.23 (5.04) p=0.015	4.53 (2.76) p<0.001
3D	**Barchilon**	**Giles**	**Griffith**	**PICO**	**Shaha**
Mean (SD) p-value	-0.11 (3.39) p=0.893	8.20 (6.24) p<0.001	5.08 (3.68) p<0.001	0.70 (4.17) p=0.488	4.05 (3.46) p<0.001
	Less experienced observers				
2D	**Barchilon**	**Giles**	**Griffith**	**PICO**	**Shaha**
Mean (SD) p-value	0.54 (5.55) p=0.683	10.00 (7.06) p<0.001	5.18 (3.87) p<0.001	-1.56 (5.77) p=0.269	4.65 (6.17) p=0.005
3D	**Barchilon**	**Giles**	**Griffith**	**PICO**	**Shaha**
Mean (SD) p-value	1.95 (6.90) p=0.248	6.13 (6.51) p<0.001	1.11 (4.05) p=0.261	0.93 (6.08) p=0.524	3.58 (5.21) p=0.010

Resultados

CONSISTENCIA + EXACTITUD

Más experimentados

Menos experimentados



Discusión

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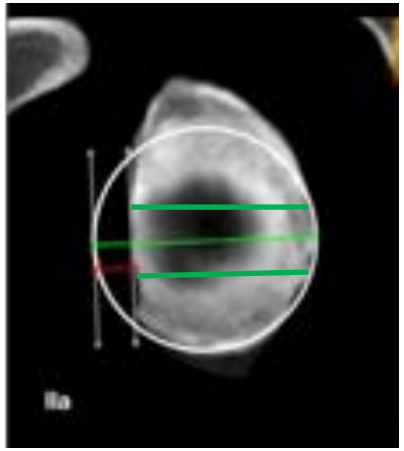
MEDICIONES DE SUPERFICIE

- **Mejores resultados**
- Bi-dimensional
- Mínima interpretación por el observador
- Independiente del tamaño y la orientación del defecto glenoideo

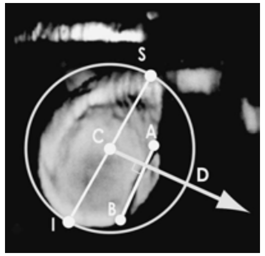
MEDICIONES LINEARES

- **Peores resultados**
- Uni-dimensional
- Requiere interpretación:
  - Altura de la medición
  - Orientación



Location of the Glenoid Defect in Shoulders With Recurrent Anterior Dislocation

Hidetomo Saito,* MD, Eiji Itoi,*† MD, Hiroyuki Sugaya,‡ MD, Hiroshi Minagawa,* MD, Nobuyuki Yamamoto,* MD, and Yilihamu Tuoheti,* MD
*From the *Department of Orthopedic Surgery, Akita University School of Medicine, Akita, Japan, and the ‡Funabashi Orthopaedic Sports Medicine Center, Funabashi, Chiba, Japan*



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Discusión

MODELOS DE FORMA ESTADÍSTICOS

- **Mayor desviación del valor real** (hasta 13.7% del defecto)
- Ventajas: buena consistencia, incluso en observadores menos experimentados
- Necesario corrección del sesgo, restando del porcentaje de defecto óseo estimado

The American Journal of Sports Medicine

What Is the Most Reliable Method of Measuring Glenoid Bone Loss in Anterior Glenohumeral Instability?

A Cadaveric Study Comparing Different Measurement Techniques for Glenoid Bone Loss

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Investigation performed at MQ Health Translational Shoulder Research Program, Faculty of Medicine & Human Sciences, Macquarie University, Sydney, Australia

Background: Preoperative quantification of bone loss has a significant effect on surgical decision making and patient outcomes. Various measurement techniques for calculating glenoid bone loss have been proposed in the literature. To date, no studies have directly compared measurement techniques to determine which technique, if any, is the most reliable.

Purpose/Hypothesis: To identify the most consistent and accurate techniques for measuring glenoid bone loss in anterior glenohumeral instability. Our hypothesis was that linear measurement techniques would have lower consistency and accuracy than surface area and statistical shape model–based measurement techniques.

Study Design: Controlled laboratory study.

Methods: In 6 fresh-frozen human shoulders, 3 incremental bone defects were sequentially created resulting in a total of 18 glenoid bone defect samples. Analysis was conducted using 2D and 3D computed tomography (CT) en face images. A total of 6 observers (3 experienced and 3 with less experience) measured the bone defect of all samples with Horos imaging software using 5 common methods. The methods included 2 linear techniques (Shaha, Griffith), 2 surface techniques (Barchilon, PICO), and 1 statistical shape model formula (Giles). Intraclass correlation (ICC) using a consistency model was used to determine consistency between observers for each of the measurement methods. Paired *t* tests were used to calculate the accuracy of each measurement technique relative to physical measurement.

Results: For the more experienced observers, all methods indicated good consistency (ICC > 0.75; range, 0.75-0.88), except the Shaha method, which indicated moderate consistency (0.65 < ICC < 0.75; range, 0.65-0.74). Estimated consistency among the experienced observers was better for 2D than 3D images, although the differences were not significant (intervals contained 0). For less experienced observers, the Giles method in 2D had the highest estimated consistency (ICC, 0.88; 95% CI, 0.76-0.95), although Giles, Barchilon, Griffith, and PICO methods were not statistically different. Among less experienced observers, the 2D images using Barchilon and Giles methods had significantly higher consistency than the 3D images. Regarding accuracy, most of the methods statistically overestimated the actual physical measurements by a small amount (mean within 5%). The smallest bias was observed for the 2D Barchilon measurements, and the largest differences were observed for Giles and Griffith methods for both observer types.

Conclusion: Glenoid bone loss calculation presents variability depending on the measurement technique, with different consistencies and accuracies. We recommend use of the Barchilon method by surgeons who frequently measure glenoid bone loss, because this method presents the best combined consistency and accuracy. However, for surgeons who measure glenoid bone loss occasionally, the most consistent method is the Giles method, although an adjustment for the overestimation bias may be required.

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Conclusiones

¿CUÁL ES EL MÉTODO MÁS FIABLE PARA MEDIR EL DEFECTO ÓSEO GLENOIDEO EN LA INESTABILIDAD GLENOHUMERAL ANTERIOR?

- ***Método de superficie Barchilon*** presenta la mejor combinación de consistencia y exactitud en observadores experimentados.
- Si la medición de defectos óseos es ocasional, el método mas consistente es el modelo de forma estadístico (*Giles*) → sobreestima el defecto óseo
- El defecto óseo “critico” parece ser **15%** (Dekker et al. AJSM 2020- utiliza método Barchilon de superficie)

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