# Collaboration Between Radiologists and Clinicians Improves Identification of Parathyroid Adenoma on 4DCT

Beverly Hershey, MD[1] Nicole Levy, MD[1]; Robert Gray, DO[1];

Thomas Chayapruks, MD[1]; Lindsay Kuo, MD[2]

[1] Temple University Hospital, Department of Radiology

[2] Temple University Hospital, Department of Surgery

Radiological Society of North America Annual Meeting 2020

**TEMPLE HEALTH**
TEMPLE UNIVERSITY HOSPITAL

# BACKGROUND

- Prior to December 2017, 4DCT rarely ordered at our institution

- Following hire of surgeon with subspecialty training in endocrine surgery, we experienced an increase in orders for 4DCT

- In reviewing preoperative and postoperative scans with the surgeon, we quickly became aware of our low sensitivity in identifying PTH adenoma compared to 93% published in the literature

# PURPOSE

PLAN objective: improve detection of
PTH adenoma by 4DCT

Prediction:  review with surgeon
will increase sensitivity

# METHODOLOGY

- Use PDSA methodology to improve identification of PTH adenomas

- Retrospective review performed following institutional IRB waiver

- Initial cycle: 7 patients scanned prior to review with surgeon from December 2017 to September 2018 with comparison of radiologists' report to surgical notes and surgical pathology from Epic records

- Second cycle (DO): 30 scans performed between September 2018 and December 2019 with preoperative review of 4DCT with surgeon, in addition to surgical notes and surgical pathology from Epic records

# Data pre and post intervention

|  | # patients | % sensitivity for laterality |
|---|---|---|
| Radiologist alone | 7 | 43 |
| Radiologist with surgeon feedback | 30 | 87 |

TEMPLE HEALTH
TEMPLE UNIVERSITY HOSPITAL

# 4DCT scan review

- Scans reviewed for:

  presence or absence of one or multiple candidate lesions

  lesion laterality

  location and size

  lesion enhancement characteristics

  identification of polar vessel

  presence and type of factors limiting evaluation

# RESULTS

- Initial study cycle: 43% sensitivity in lateralizing candidate lesions by radiologists alone

- Second cycle: 73% sensitivity for lesion laterality by radiologists alone, increasing to 87% in review with surgeon

- Correlation with surgeon feedback and operative results lead to identification of lesions that did not demonstrate classic imaging features of marked contrast enhancement on arterial phase imaging with washout on delayed images, identification of a polar artery, or those obscured by artifact or located posterior to a thyroid mass

# Summary of PDSA cycle

Changes for next cycle: reduce artifacts limiting PTH adenoma detection by 4DCT

What was learned? Sensitivity of PTH adenoma detection by radiologist increased two fold by collaborating with surgeon
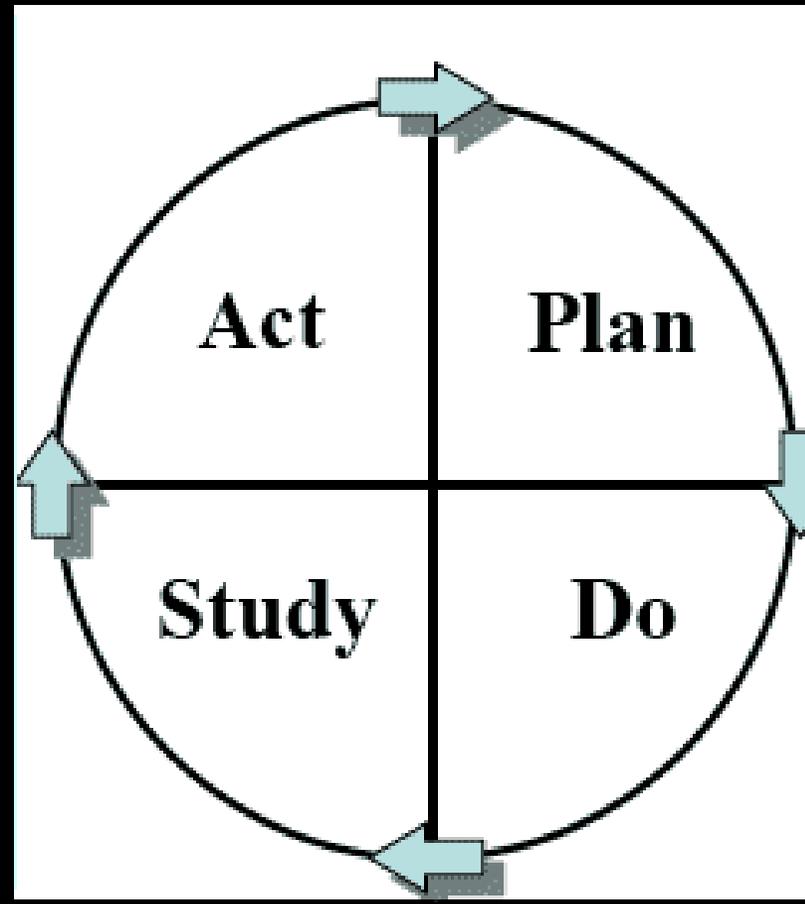
Objective: improve detection of PTH adenoma by 4DCT Prediction: review with surgeon will increase sensitivity

Collect and analyze data for identification of PTH adenoma by review of 4DCT with surgeon and comparison to surgical results



Act    Plan

Study    Do

# CONCLUSION

- Clinical feedback aids in increasing radiologists' sensitivity of interpretation of 4DCT in identifying parathyroid adenomas

- Clinical feedback is essential in quality improvement of radiology results reporting of candidate lesions

# References

1. Bahl M, Sepahdari AR, Sosa JA, Hoang JK. Parathyroid Adenomas and Hyperplasia on Four-dimensional CT Scans: Three Patterns of Enhancement Relative to the Thyroid Gland Justify a Three-Phase Protocol. Radiology. 2015 Nov;277(2):454-62. doi: 10.1148/radiol.2015142393. Epub 2015 May 29.

2. Hoang JK, Sung WK, Bahl M, Phillips CD. How to perform parathyroid 4D CT: tips and traps for technique and interpretation. Radiology. 2014 Jan;270(1):15-24. doi: 10.1148/radiol.13122661.

3. Chazen **JL**, Gupta **A**, Dunning **A,** Phillips **CD.** Diagnostic Accuracy of 4D-CT for Parathyroid Adenomas and Hyperplasia. American Journal of Neuroradiology March 2012, 33 (3) 429-433; doi: 10.3174/ajnr.A2805

4. Kunstman JW, Kirsch JD, Mahajan A, Udelsman R. Parathyroid Localization and Implications for Clinical Management. *The Journal of Clinical Endocrinology & Metabolism*, Volume 98, Issue 3. March 2013. Pages 902–912. doi: 10.1210/jc.2012-3168

5. Perrier ND, Edeiken B, Nunez R, Gayed I, Jimenez C, Busaidy N, Potylchansky E, Kee S, Vu T. A novel nomenclature to classify parathyroid adenomas. World J Surg. 2009 Mar;33(3):412-6. doi: 10.1007/s00268-008-9894-0

6. Bann DV, Zacharia T, Goldenberg D, Goyal N. Parathyroid localization using 4D-computed tomography. *Ear Nose Throat J*. 2015;94(4-5):E55–E57. doi: 10.1177/014556131509404-506

7. Parathyroid Exploration in the Reoperative Neck: Improved Preoperative Localization with4D-Computed Tomography. Mortenson MM, Evans DB, Lee JE, et al. Parathyroid exploration in the reoperative neck: improved preoperative localization with 4D-computed tomography. J Am Coll Surg. 2008; 206:888-895. DOI: https://www.ncbi.nlm.nih.gov/pubmed/18471717

8. 4D Parathyroid CT as the Initial Localization Study for Patients with De Novo Primary Hyperparathyroidism. Starker LF,Mahajan A, Bjorklund P, Sze G, Udelsman R, Carling T. 4D Parathyroid CT as the initial localization study for patients with de novo primary hyperparathyroidism. Ann Surg Oncol. 2011;18: 1723–1728

9. Diagnostic performance of computed tomography for parathyroid adenoma localization; a systematic review and meta-analysis. Kluijfhout WP, Pasternak JD, Beninato T, Drake FT, Gosnell JE, Shen WT, Duh QY, Allen IE, Vriens MR, de Keizer B, Hope TA, Suh I. Eur J Radiol 2017 Mar;88:117-128. doi: 10.1016/j.ejrad.2017.01.004. Epub 2017 Jan 5.