



**University Hospitals Dorset**  
NHS Foundation Trust

# Sequential Improvement in Parathyroid Adenoma Localization (SImPAL)

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# Introduction

- Primary hyperparathyroidism can only be cured by removal of the culpable adenoma.
- Accurate localization of an adenoma allows a surgeon to perform focused excision rather than full neck exploration, leading to reduced complication risk, recovery time and cost.
- Our dual phase  $^{99m}\text{Tc}$ -Sestamibi scan was performing poorly.
- A series of improvements were proposed following discussion with radiologists, physicists, technologists, endocrinologists and surgeons.
- Aim: to improve the sensitivity of adenoma localization and increase confidence of the radiology report.
- Intended outcome: a greater number of patients are able to undergo minimally invasive surgery.

# Methods

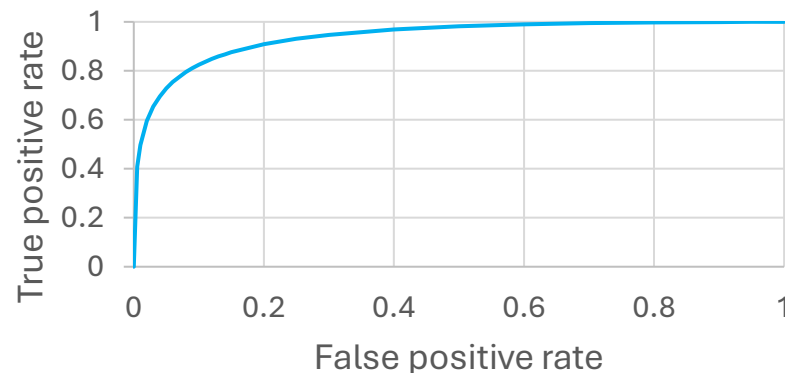
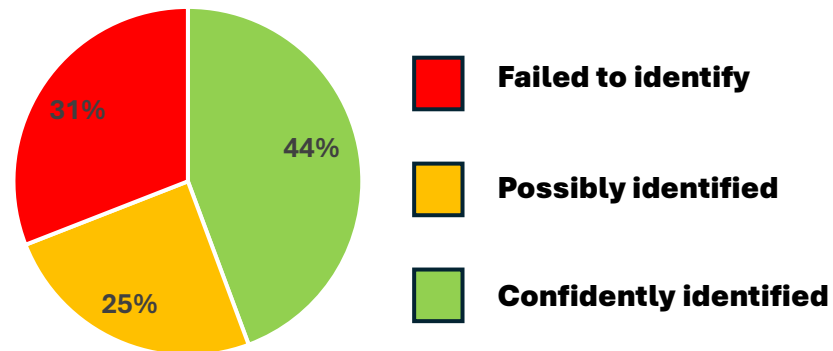
- A 5-point scale was assigned to each sestamibi report based on wording and lesion description
- Assignment was undertaken blind to surgical outcome
- Following surgery, sestamibi report location was compared to true location of adenoma from pathological notes.
- Scale used to calculate ROC curves

## Radiologist report confidence

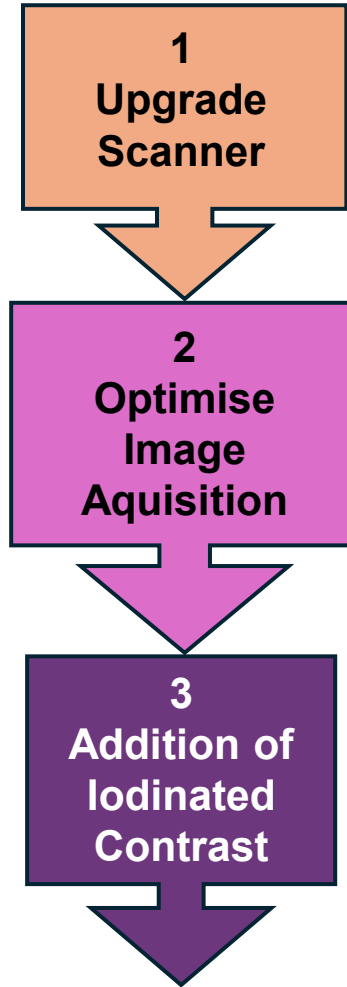
1	<u>No adenoma seen</u> Unconvincing lesion seen on CT component only Unlikely location No tracer or contrast uptake
2	<u>Unlikely adenoma</u> Suspicious lesion seen on CT component only Likely location No tracer or contrast uptake
3	<u>Possible adenoma</u> Some tracer retention but no lesion on CT component Some tracer in lesion but not enhancing Intra-thyroid nodule with some tracer uptake Enhancing lesion but no tracer retention
4	<u>Likely adenoma</u> Any element of doubt in wording Enhancing lesion with some tracer uptake Good tracer uptake but only some enhancement
5	<u>Adenoma identified</u> No doubt in the report

# Baseline results

- Initial audit of 194 reports.
  - 31% failed to identify adenoma
  - 44% confidently identified adenoma present
- 163 patients went on to surgery
- Pathological notes were then assessed to determine whether adenoma present, and true location.
- Screening statistics for sestamibi scans in this study
  - Sensitivity = 69.8%
  - Specificity = 95.7%
  - AUC = 0.92

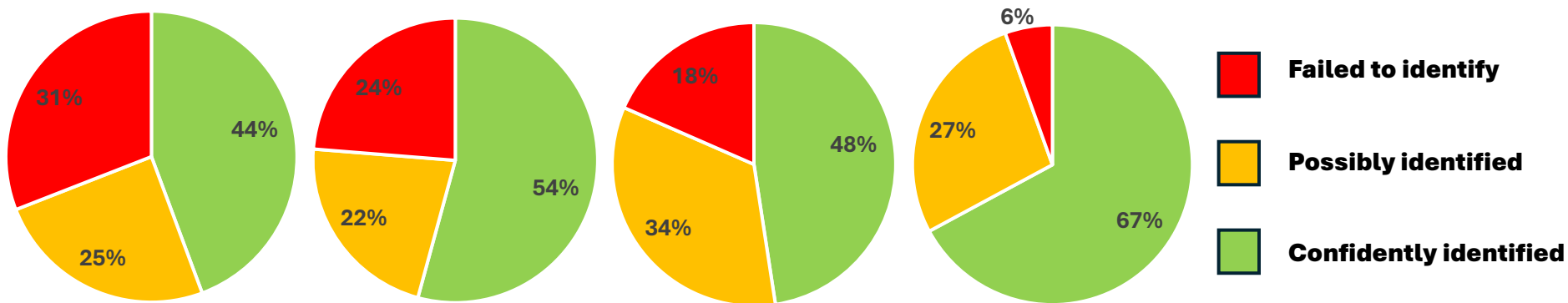
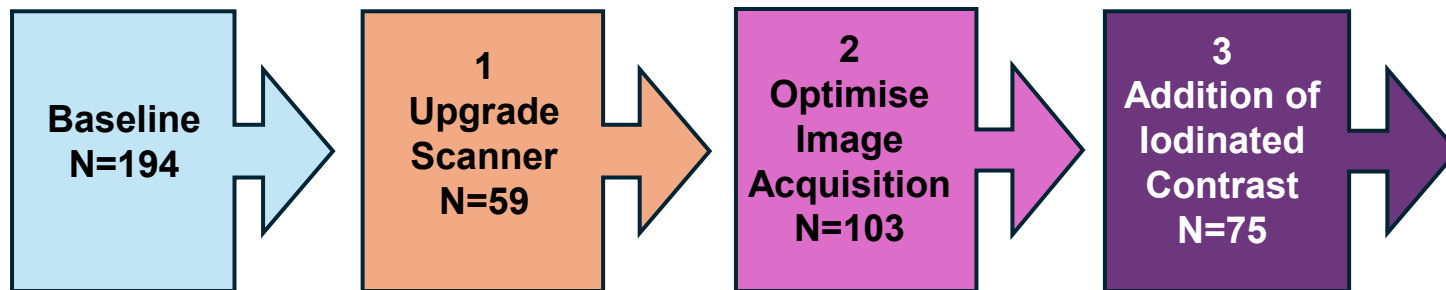


# Interventions



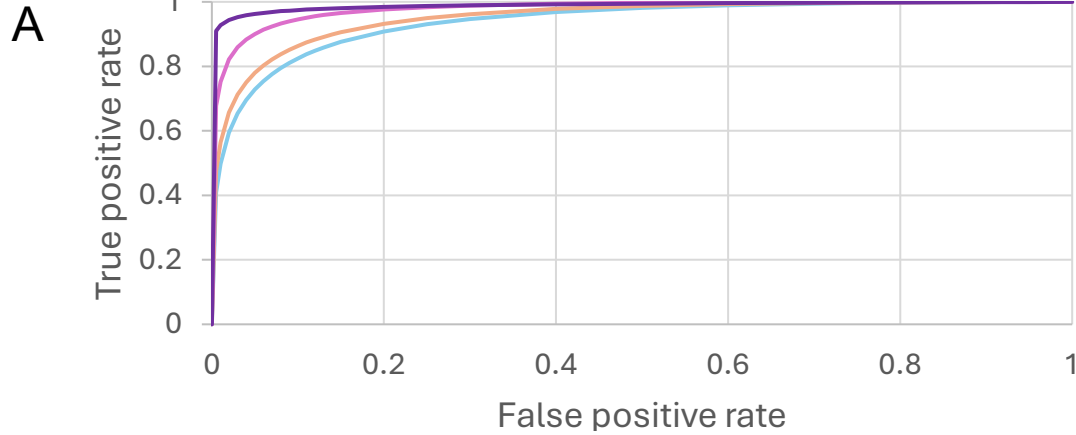
1. Upgraded SPECT/CT scanners
  - Siemens Symbia T to Siemens Intevo Bold
2. Optimised image acquisition
  - Step and shoot acquisition over previous continuous acquisition
  - Increased administered activity from 750Mbq to 900Mbq <sup>99m</sup>Tc-Sestamibi
  - Changed SPECT reconstruction parameters (increased product of subsets and iterations)
3. Addition of arterial phase iodinated contrast
  - Dropped the early phase of SPECT acquisition

# Improvement in reporter confidence



Pie charts showing proportion of adenomas confidently identified following each intervention

# ROC analysis



● Baseline

Sensitivity: 69.8%

Specificity: 95.7%

AUC: 0.92

● Intervention 1 (New scanner)

Sensitivity: 77.6%

Specificity: 93.3%

AUC: 0.95

● Intervention 2 (Optimise acquisition)

Sensitivity: 84.3%

Specificity: 95.9%

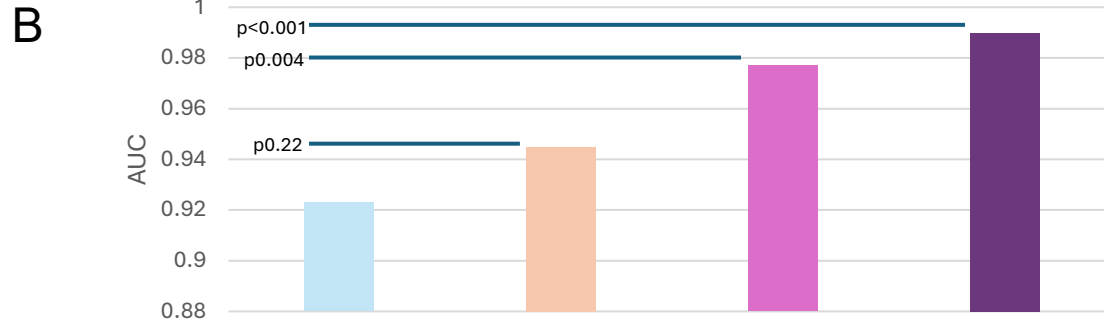
AUC: 0.98

● Intervention 3 (Contrast added)

Sensitivity: 94.7%

Specificity: 90.0%

AUC: 0.99



Results of ROC analysis. A) ROC curve for each intervention. B) AUC value for each intervention. Statistical analysis using DeLong test for 2 correlated ROC curves shown (compared to baseline).

# Summary

- We have demonstrated significant sequential improvement in adenoma localization as well as radiologist report confidence following each intervention.
- Improved adenoma localization has resulted in fewer full neck exploration surgeries being performed.
  - Consequent improved patient safety, length of stay and reduced cost.
- Limitations: Retrospective analysis therefore risk of bias and low patient numbers in final intervention at time of reporting.





Thank You

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