

Utility of Parathyroid Autofluorescence in Thyroidectomy –a matched pair analysis

Natarajan Ramalingam, MS, DNB, Deepa Nair, MS, DNB, Vidisha Tuljapurkar, MS MCh, Kinshuk Chatterjee, MS, Pankaj Chaturvedi, MS FACS
Department of Head and Neck Surgery, Tata Memorial Centre, Mumbai, India



Background and Aim

- ❖ Total thyroidectomy – results in post-operative hypoparathyroidism (HypoPT) in 20 – 30% of patients [permanent in 1 – 4% of patients]¹
- ❖ Inherent Autofluorescence of parathyroids using Near infra-red imaging assisted autofluorescence [NIR-AF]² can be used to
 - Improve identification rates during surgery can be improved
 - Decrease incidence of hypocalcemia post operatively
- ❖ **This study assess the Impact of Parathyroid Autofluorescence** on
 - Parathyroid identification
 - Incidence of post-operative hypoparathyroidism

Methods

Retrospective case control study with 95 % Propensity matching [1:2 ratio]
Matched for central compartment dissection and the type of surgery performed

Experimental (n=12)	Control (n=24)
Total thyroidectomy ± CCND and Visual Identification of Parathyroids + NIR AF	Total thyroidectomy ± CCND and Visual Identification of Parathyroids ONLY
NIR-AF assessment done on both sides, operative bed & thyroidectomy specimen	Visual identification of Glands and vascularity assessment
Degree of autofluorescence was documented as scores of 0,1 and 2 (absent, mild and normal glow)	
Decision to reimplant the parathyroid gland and the number of glands to be reimplanted	
As per the score in experimental arm	According to visual identification of discoloration of parathyroid gland

Outcome Variables

- Postoperative hypocalcaemia
- Parathyroid identification rates
- Reimplantation rates
- Inadvertent resection of parathyroid (presence of parathyroid glands in final histopathology)

Results

❖ Post-operative hypocalcemia

The NIR-AF cohort had significantly lower postoperative hypocalcemia rates **(41.7 %) vs 83.3%** in the Control group
[p 0.045 Mann Whitney]

The symptomatic hypocalcemia rates were 16.66% and 41.7% respectively [p NS]

❖ Parathyroid Identification rates

The NIF-AR group had an increased mean number of identified parathyroids **(4 vs 3.46 ± 0.77)** [p 0.02 t test]

The false positive rate in NIR AF group was 2.08%

❖ Reimplantation and Inadvertent resection

No significant difference in the inadvertent resection rates (2% vs 8.3%) and reimplantation rates (8.33% vs 5.2%) between cohorts

Non-significant trend towards (p = 0.20) early return of serum calcium levels to normalcy in experimental cohort (4.2 days vs 6.25 days)

❖ Added advantage of NIR AF

Parameter	Experimental n = 12	Control n = 24
No. of Parathyroid identified visually	42/48 (87.5%)	83/96 (86.4%)
No. of Parathyroid identified using Fluoptics	48/48 (100%)	Improvement in identification rate on adding NIR AF to visual identification

When the total score of all glands was ≤ 3, there was significant co-relation with increase incidence of hypocalcemia [p 0.002 Chi square]

All patients in NIR-AF group recovered from hypocalcemia while two patients (8.33%) in control group have persistent hypocalcemia at 4 months post-surgery.

Conclusion

Near-infrared use during total thyroidectomy aids by

- **Significant reduction of Postoperative hypocalcemia**
- **Improved parathyroid identification** and guides reimplantation

Further randomised studies incorporating enhanced autofluorescence with ICG dyes are required to better understand the utility of autofluorescence

References

1. Duclos A, Peix J-L, Colin C, Kraimps J-L, Menegaux F, Pattou F, et al. Influence of experience on performance of individual surgeons in thyroid surgery: prospective cross sectional multicentre study. BMJ [Internet]. 2012 Jan 11 [cited 2020 Apr 10];344
2. McWade MA et al. Establishing the clinical utility of autofluorescence spectroscopy for parathyroid detection. Surgery. 2016;159(1):193-202. doi:10.1016/j.surg.2015.06.047