Vol 4 | Issue 41 |2023

PHYSICIAN CONNECT

Dear Doctor,

Greetings from Micro Labs. We are happy to bring you "Physician Connect" which contains latest and interesting news.

This issue contains:

1. A study on evaluation of non-invasive ventilation in the treatment of acute exacerbations of chronic obstructive pulmonary disease.
2. A study on evaluation of Isthmus Preservation Effects on Postoperative Hypothyroidism after Lobectomy.
3. A study on assessing the possibility of using dynamic chest radiography to estimate lung sizes in adults with cystic fibrosis.
4. A case report of a papillary and follicular thyroid cancer colliding.

Should you require any article or, medical information, please feel free to contact us at medicalservices@microlabs.in

Looking forward to your valuable feedback.

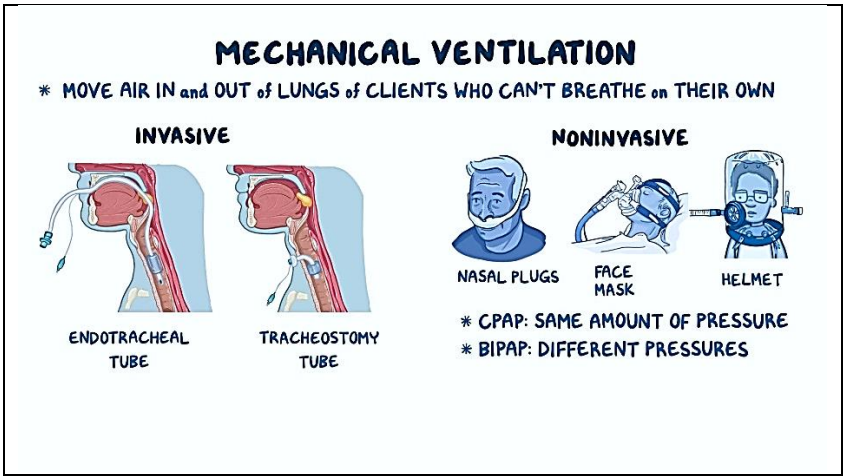
Best Regards,

Medical Team, Micro Labs Limited.s

A study on evaluation of non-invasive ventilation in the treatment of acute exacerbations of chronic obstructive pulmonary disease

Introduction:

Non-invasive ventilation (NIV) is a well-established in-hospital treatment for acute respiratory insufficiency (ARI), although evidence for its use in the prehospital context is insufficient. NIV is described as mechanical ventilation via a non-invasive interface. NIV increases oxygenation through positive end-expiratory pressure (PEEP) and decreases work of breathing through pressure support [(1)]. Additionally, NIV results in fewer problems than invasive ventilation, such as infections linked to the ventilator. NIV increases gas exchange, lowers work of breathing, and shortens hospital stay and death in chronic obstructive pulmonary disease (COPD) patients with acute hypercapnic respiratory failure. Additionally, NIV results in less complications than invasive ventilation, such as infections linked to the ventilator. These findings led to recommendations in the guidelines for the use of NIV in acute respiratory failure caused by an exacerbation of COPD [(2)]. The purpose of this study was to assess guideline adherence to NIV for acute COPD exacerbations and investigate the effect on mortality.



Invasive and non-invasive ventilation

Methods:

This retrospective analysis included 1162 patients hospitalised to the pulmonary ward or critical care unit with a COPD exacerbation. In the case of a respiratory acidosis proved by arterial or capillary blood gas measurement, NIV was investigated. Adherence to recommendations was calculated using descriptive analysis. The Fisher's exact test was used to compare categorical data.

Results:

There were 1162 admissions (668 distinct patients) in total. NIV was initiated in 154 of 204 admissions (76%) when NIV was suggested at the time of admission. NIV was begun in 51 admissions (65%) of the 78 hospitalisations where patients deteriorated later on. When patients were excluded from receiving NIV because of contraindications or patient refusal, the total guideline adherence rate was 82%. In patients where NIV was started later in the hospital, there

were no differences in in-hospital mortality (hospital A vs. B: 10.0 vs. 27.8%, p=0.292, OR 3.461 [0.344- 34.843]) or 90-day mortality (hospital A vs. B: 50.0 vs. 44.4%, p=0.778, OR 0.800 [0.170-3.767]) (table1). The most common reasons for not commencing NIV when advised were a lack of recognised indicators of respiratory distress, a preference for just comfort care, and a watchful waiting strategy. Patients who got NIV when recommended had a higher chance of survival than those who did not.

Table 1: Treatment details of non-invasive ventilation started later during hospitalisation

	All admissions (n=51)	Hospital A (n=14)	Hospital B (n=37)
Place of treatment, %			
Pulmonary ward	57	64	54
ICU	43	36	46
IPAP, cmH_2O	16 [13 – 21]	22 [15 – 25]	14 [12 – 20]
EPAP, cmH_2O	6 [4 – 8]	6 [6 – 8]	5 [4 – 7.8]
NIV length, days	1.0 [0.2 – 3.2]	2.0 [1.0 – 4.5]	1.0 [0.2 – 3.0]
Reasons for NIV termination, %			
According to protocol	39	57	32
NA, started/known with chronic NIV	4	7	3
Patient wanted to terminate	12	7	14
Palliative trajectory	16	7	19
NIV was not effective	-	-	-
Transfer to invasive ventilation	22	21	22
Mask problems	2	-	3
Switch to high-flow therapy	4	-	5
Clinical improvement (still acidotic)	2	-	3
Unknown	-	-	-

Discussion:

The outcomes of this study showed that NIV was commenced in 76% of the admissions where NIV was suggested at admission, and in 65% of the admissions where the patient deteriorated subsequently during hospitalisation. For the cohort of 668 different patients, the overall in-hospital and 90-day death rates were 6% and 14%, respectively[(2)].in a previous study by Sprooten RTM et al showed that the rate of in-hospital death was 14.1% (n = 11). The mortality rate during follow-up was 29.5% at 90 days, 43.6% at one year, and 56.4% at two years [(3)].

Conclusion:

The adherence to NIV beginning guidelines is satisfactory. However, further enhancing NIV therapy in actual practise might be accomplished by educating healthcare personnel to raise knowledge and minimise hesitation to use NIV. Patient outcomes may be improved further by addressing these aspects.

The adherence to Non-invasive ventilation (NIV) starting standards is acceptable. However, teaching medical staff to increase awareness and reduce resistance to employ NIV might further improve NIV therapy in real practise.

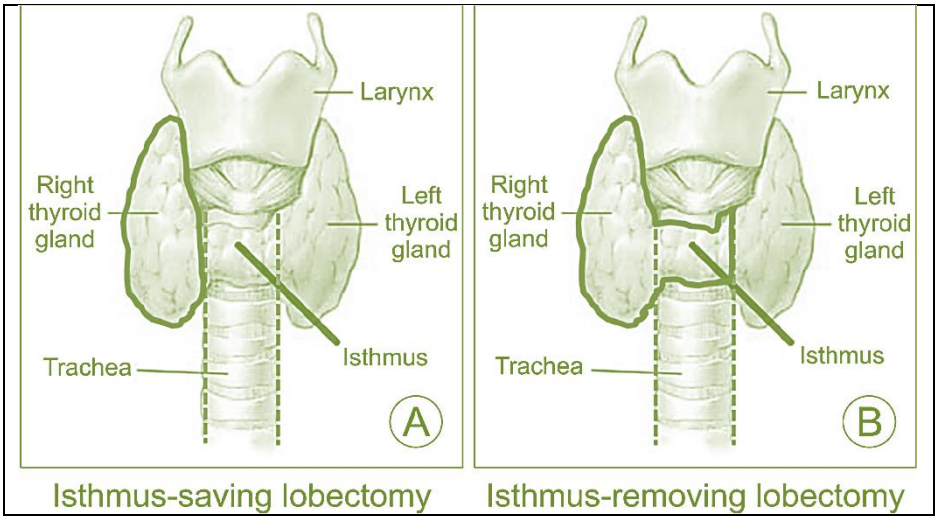
Reference:

1. Schmitt FC, Gruneberg D, Schneider NR, Fögeling JO, Leucht M, Herth F, Preusch MR, Schmidt W, Bopp C, Bruckner T, Weigand MA. Non-invasive ventilation as a therapy option for acute exacerbations of chronic obstructive pulmonary disease and acute cardiopulmonary oedema in emergency medical services. Journal of Clinical Medicine. 2022 Apr 29;11(9):2504.
2. Elshof J, Vonk JM, van der Pouw A, van Dijk C, Vos P, Kerstjens HAM, Wijkstra PJ, Duiverman ML. Clinical practice of non-invasive ventilation for acute exacerbations of chronic obstructive pulmonary disease. Respir Res. 2023 Aug 23;24(1):208.
3. Sprooten RT, Rohde GG, Janssen MT, Cobben NA, Wouters EF, Franssen FM. Predictors for long-term mortality in COPD patients requiring non-invasive positive pressure ventilation for the treatment of acute respiratory failure. The Clinical Respiratory Journal. 2020 Dec;14(12):1144-52.

A study on evaluation of Isthmus Preservation Effects on Postoperative Hypothyroidism after Lobectomy

Introduction:

Thyroid nodules, which comprise both benign and malignant thyroid tumours, are surgically treated. The usual surgical procedure of thyroid lobectomy includes excision of roughly half of the thyroid gland along the isthmus. According to the published research the thyroid hormone is necessary for the recovery and maintenance of euthyroid state in individuals with hypothyroidism, which occurs in 22–85% of patients who have thyroid lobectomy [(1)]. Therefore, 20–47% of individuals still need to take thyroid hormone prescriptions following lobectomy.



Preoperatively high thyroid-stimulating hormone (TSH) levels, antithyroid peroxidase (anti-TPO) antibody positivity, and lymphocytic infiltration in the thyroid gland are risk factors for hypothyroidism following lobectomy [(2)]. The purpose of this study was to see if preserving the isthmus to preserve thyroid function helps to minimise hypothyroidism following lobectomy.

Methods:

This Retrospective study included 144 patients with benign or low-risk papillary thyroid carcinoma and euthyroid condition, 100 of whom received isthmus-saving lobectomy (IS group) and 44 of whom underwent isthmus-removing lobectomy (IR group). Thyroid function tests (TSH) were done three, six, twelve, and twenty-four months following surgery. Patients with noticeable hypothyroidism and those with subclinical hypothyroidism who complained of evident hypothyroid symptoms were given levothyroxine. Categorical variables were compared using the chi-square test, Fisher's exact test, or Pearson's correlation analysis. SPSS Version 20.0 was used for the analysis.

Results:

TSH levels in the IS group were considerably lower three and six months after surgery ($p=0.049$ and 0.026, respectively). Among patients having TSH values of <2 µIU/mL

preoperatively, 17 patients (17/66=25.8%) in the IS group had substantially maintained TSH levels at <2 µIU/mL even after surgery, compared to 2 patients (2/21=9.5%) in the IR group (p=0.039). In the IS group, there were substantially fewer patients who took medicine after surgery than in the IR group 10 (10%) versus 14 (31.8%) and postoperative overt hypothyroidism was detected in 5 patients (5.0%) in the IS group and 6 patients (13.6%) in the IR group (p=0.048) (table 1).

Table 1:Comparison of postoperative hypothyroidism and medication initiation between the isthmus-saving and isthmus-removing groups

	IS group	IR group	p value
Total patients (n=144)	n=100 (69.4%)	n=44 (30.5%)	
Euthyroid	67 (67%)	26 (59%)	0.36
Overt hypothyroidism	5 (5%)	6 (13.6%)	0.04
Medication start	10 (10%)	14 (31.8%)	0.01
Preoperative TSH<2 patients (n=87)	n=66 (75.9%)	n=21 (24.1%)	
Euthyroid	55 (83.3%)	18 (85.7%)	0.79
TSH<2	17 (25.8%)	2 (9.5%)	0.04
Medication start	3 (4.5%)	2 (9.5%)	0.39
Preoperative 3<TSH<4.2 patients (n=22)	n=14 (63.6%)	n=8 (36.3%)	
Euthyroid	2 (14.2%)	2 (25%)	0.53
Overt hypothyroidism	1 (7.1%)	2 (25%)	0.04
Medication start	3 (21.4%)	5 (62.5%)	0.02

IR: isthmus removing, IS: isthmus saving, TSH: thyroid stimulating hormone

Discussion:

This study result demonstrated that when compared to isthmus-removing lobectomy, isthmus-saving lobectomy lowered the incidence of postoperative hypothyroidism and medication intake and helped to maintain a low TSH level postoperatively. Although lobectomy offers various advantages, a fraction of individuals who have thyroid lobectomy may develop hypothyroidism, and hence may not provide freedom from thyroid hormone replacement [(2)]. Further in a previous study by Dongbin Ahn et al showed that after hemithyroidectomy, 55.8% of patients developed hypothyroidism [(3)].

Conclusion:

In conclusion, as compared to isthmus-removing lobectomy, isthmus-saving lobectomy reduced the incidence of postoperative hypothyroidism and medication intake and helped to maintain a low TSH level.

The incidence of postoperative hypothyroidism and medication use were decreased with isthmus-saving lobectomy compared to isthmus-removing lobectomy, which also helped to maintain a low thyroid-stimulating hormone (TSH) level.

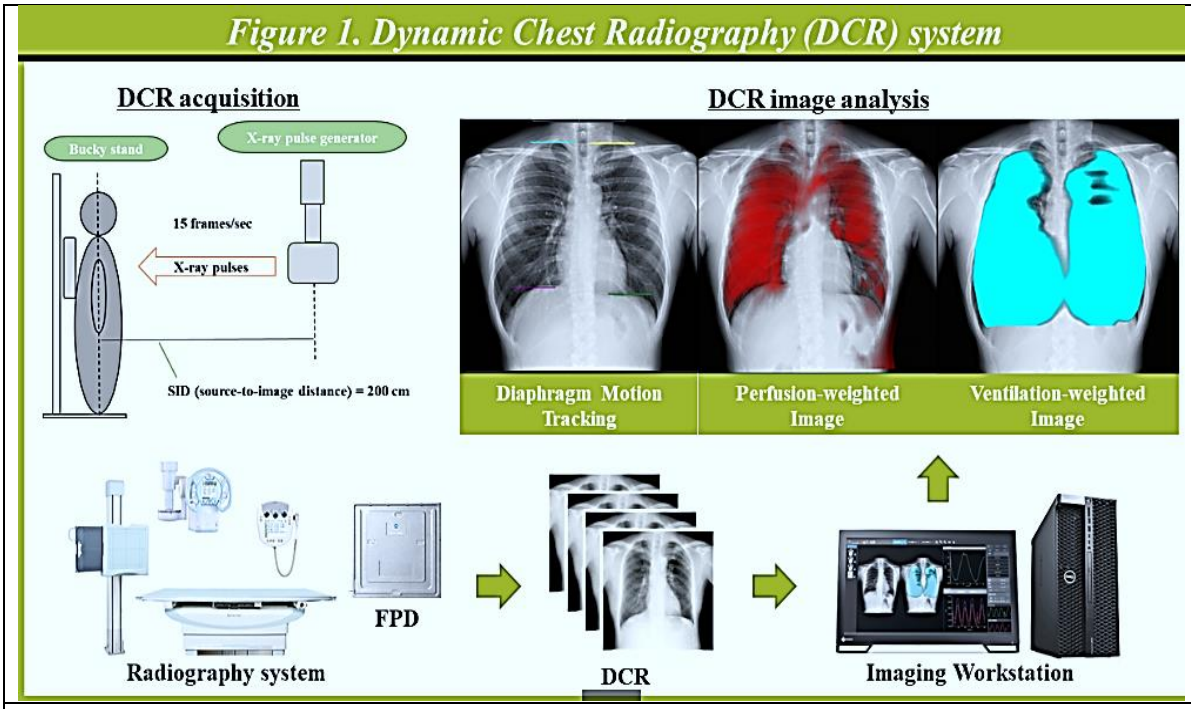
Reference:

1. Cho MJ, Yu HW, Kim W, Kim YK, Choi SI, Kim SJ, Chai YJ, Lee D, Park SJ, Choi JY, Lee KE. Comparison of the Incidence of Postoperative Hypothyroidism in Patients Undergoing Conventional Thyroid Lobectomy and Pyramid- and Isthmus-Preserving Lobectomy. Int J Endocrinol. 2021 Oct 25; 2021:8162307. doi: 10.1155/2021/8162307. PMID: 34733327; PMCID: PMC8560291.
2. Yeon Jin Jeon, Wan Wook Kim. Effects of Isthmus Preservation on Postoperative Hypothyroidism after Lobectomy. International journal of thyroidology. 2023 May 30;16(1):120–7.
3. Dongbin Ahn and others, Hypothyroidism Following Hemithyroidectomy: Incidence, Risk Factors, and Clinical Characteristics, The Journal of Clinical Endocrinology & Metabolism, Volume 101, Issue 4, 1 April 2016, Pages 1429–1436, https://doi.org/10.1210/jc.2015-3997

A study on assessing the possibility of using dynamic chest radiography to estimate lung sizes in adults with cystic fibrosis.

Introduction:

Dynamic chest radiography (DCR) is a functional X-ray imaging technique that uses a flat-panel detector to give pulmonary ventilation and circulation results. Imaging is carried out similarly to a traditional chest examination, with the exception of breathing pattern [(1)]. Lung volume subdivisions can offer crucial prognostic and diagnostic details regarding lung health in people with cystic fibrosis (pwCF). Total lung capacity (TLC) is crucial for matching donors and recipients and for understanding the breathing patterns associated with transplantation. Functional residual capacity (FRC) may serve as a sensitive diagnostic for the early stages of lung illness. Inspiratory capacity (IC) is a subtle marker of lung function decline and exercise capacity. DCR creates a "moving chest radiograph" that allows for the observation of thoracic structures during the breathing cycle. The projected lung area (PLA) may be tracked throughout various breathing phases using automated recognition of visible lung borders in the posteroanterior (PA) projection (2). The objectives of the present study were to evaluate the viability of calculating lung volume subdivisions in pwCF using PA and lateral DCR, investigate the relationship between DCR lung areas and pulmonary function testing (PFTs) carried out by whole-body plethysmography (WBP), and create models for calculating lung volume subdivisions using DCR lung areas.



Dynamic Chest Radiography (DCR) system

Methods:

In this pilot study a total of 20 patients were recruited (age 30±9 years, predicted FEV1 79±25, BMI 24±4 kg/m2, 6 female) and assesses the lung volume subdivisions by DCR utilising projected lung area (PLA) during deep inspiration, tidal breathing, and complete expiration, and compared to same-day WBP in adult pwCF. Plethysmography measurements were performed using global lung initiative reference values. Konica Minolta's proprietary software was used to examine DCR photos. To predict lung volumes using PLA, linear regression models were used. The mean of the differences and Bland-Altman plots were used to evaluate the consistency of DCR and WBP-calculated TLC.

Results:

There were no adverse events recorded as part of the trial. The correlation between total lung area (PLA at maximum inspiration) and total lung capacity (TLC) was 0.78 ($p<0.001$), between functional residual lung area and functional residual capacity (FRC) was 0.91 ($p<0.001$), between residual lung area and residual volume was 0.82 ($p=0.001$), and between inspiratory lung area and inspiratory capacity was 0.72 ($p=0.001$) (Fig 1). Despite the small sample size, accurate models for TLC, residual volume (RV), and FRC prediction were developed.

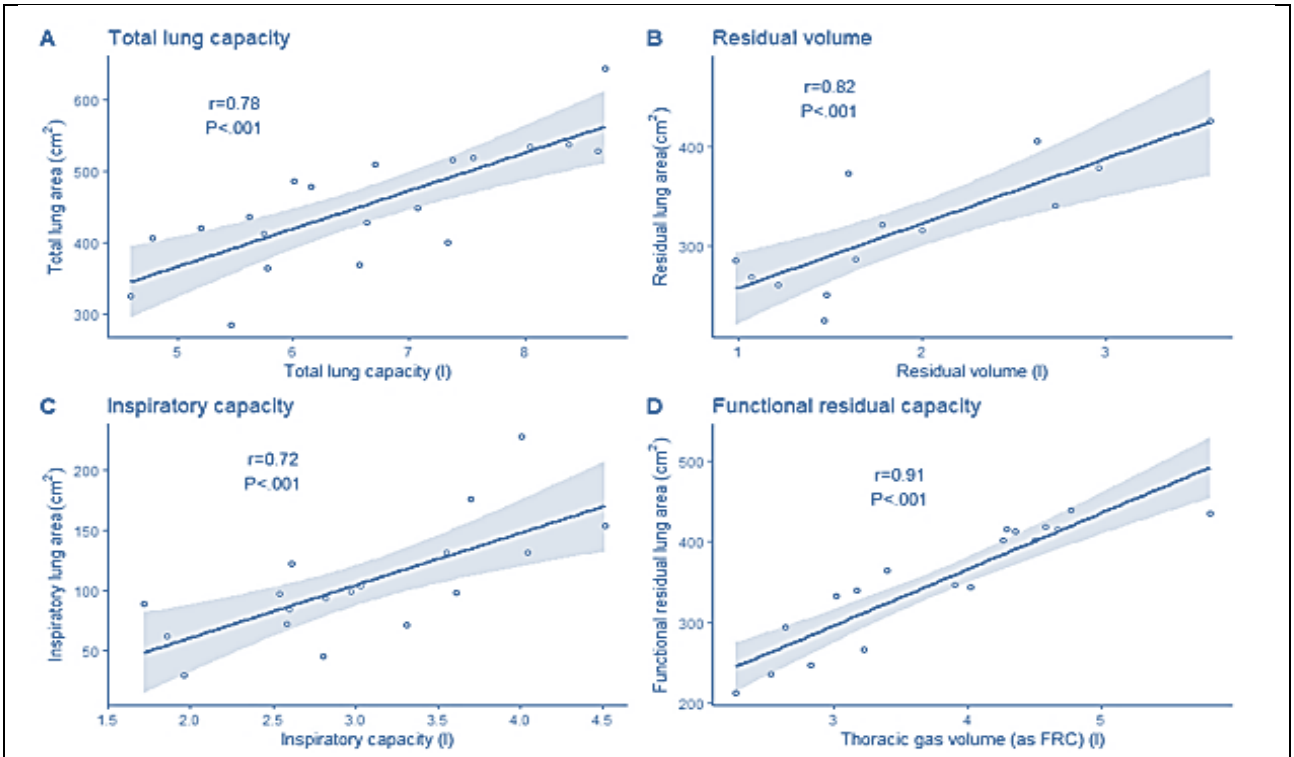


Fig 1: Correlation between projected lung areas and whole-body plethysmography lung volume subdivisions. **A:** total lung volume and total lung area; **B** residual volume with residual lung area; **C** inspiratory capacity with inspiratory lung area; **D** functional residual capacity (as thoracic gas volume) with functional residual lung area.

Discussion:

This was the first study to investigate the use of DCR in assessing lung volume subdivisions in adult pwCF, which is an essential indicator of lung health in this group. Considering the short sample size, there were strong and reasonable associations between DCR lung regions and

plethysmographic lung volumes (2). The favourable correlations obtained between WBP-calculated and DCR-calculated TLC (r=0.87) were similar to those observed with ultra-low-dose CT in pwCF by Lacerda et al (3) (TLC r=0.71).

Conclusion:

This pilot research shows probable connections between DCR lung regions and clinically significant plethysmographic lung volume subdivisions. Larger studies with a broader variation in age, BMI, and the spectrum of CF lung disease, as well as the addition of healthy non-CF controls, will investigate this method further.

A promising new technology called Dynamic chest radiography (DCR) may be utilised to calculate the subdivisions of the lung capacity. Plethysmographic lung volumes and DCR lung regions were shown to have significant connections.

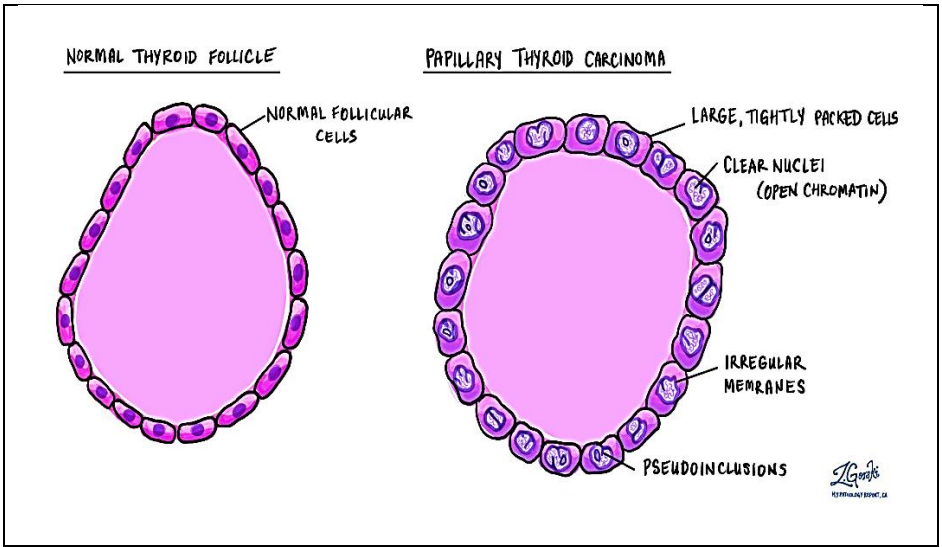
Reference:

1. Tamura M, Matsumoto I, Saito D, Yoshida S, Takata M, Tanaka R, Takemura H. Dynamic chest radiography: Novel and less-invasive imaging approach for preoperative assessments of pleural invasion and adhesion. Radiology Case Reports. 2020 Jun 1;15(6):702-4.
2. FitzMaurice TS, McCann C, Nazareth D, Hawkes S, Shaw M, McNamara PS, Walshaw M. Feasibility of dynamic chest radiography to calculate lung volumes in adult people with cystic fibrosis: a pilot study. BMJ Open Respiratory Research. 2023 May 1;10(1):e001309.
3. Lacerda LS, Lopes AJ, Carvalho ARS, Guimarães ARM, Firmida MC, Castro MCS, Mogami R, Melo PL. The Role of Multidetector Computed Tomography and the Forced Oscillation Technique in Assessing Lung Damage in Adults with Cystic Fibrosis. Respir Care. 2018 Apr;63(4):430-440.

A case report of a papillary and follicular thyroid cancer colliding.

Introduction:

Both papillary thyroid carcinoma (PTC) and follicular thyroid carcinoma (FTC) are thyroid malignancies that arise from thyroid follicular cells. PTC is the most frequent kind, accounting for 75-80% of cases, while FTC is the second most prevalent type, accounting for around 10% of all thyroid cancers [(1)]. Collision tumour is a clinical phenomenon in which two histologically different tumour types develop at the same anatomic location. Collision tumours are uncommon in the thyroid gland, accounting for less than 1% of all thyroid cancers; the most common combination is PTC foci with medullary thyroid carcinoma [(2)]. In this case report, a PTC and FTC collision tumour is discussed. The tumour tissue displayed various histologies, phenotypes, and genetic changes.



Papillary thyroid carcinoma

Case presentation:

A 69-year-old woman with dysphagia went to a local hospital. She became aware of a right cervical mass two months ago, and the mass lesion grew larger when dysphagia emerged. She had a history of asthma and high blood pressure, but no family history of thyroid illness. Ultrasonography showed a well-defined mass in the right lobe of the thyroid gland and an indistinct mass

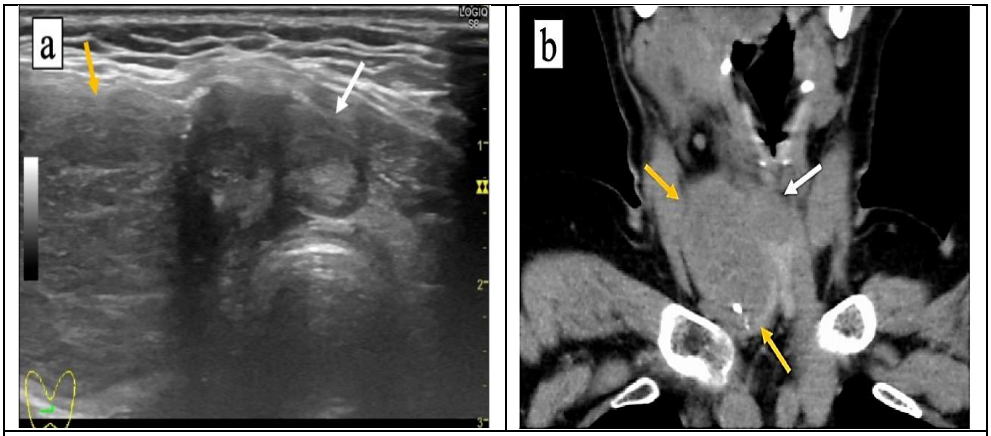


Fig1(a): representative ultrasound imager. The right thyroid glands lobe has a well-marked mass lesion (yellow arrow), and the isthmus has an unclear mass lesion (white arrow). **1(b):** A representative CT scan picture. The mass lesion in the isthmus (white arrow) and tumour of the right thyroid lobe (yellow arrow) are visible.

in the isthmus, and laryngoscopy confirmed right vocal cord paralysis (Fig 1a). The CT scan revealed two tumours in the right lobe and isthmus of the thyroid that were about 4 cm and 2 cm in diameter, respectively, as well as many cervical lymph node swellings (Fig. 1b). Preoperative fine needle aspiration cytology was conducted on the enlarged right cervical lymph node, and the cytological diagnosis was "PTC," which is classified as Category VI in the Bethesda classification. The patient underwent a complete thyroidectomy, right neck dissection, and bilateral paratracheal dissection for PTC with numerous lymph node metastases. During surgery, there was no indication of any remaining tumour.

Yellowish-brown and white lumps could be seen on the tumor's cut surface (Fig. 2a, b). The tumour cells in this lesion tested positive for Thyroid transcription factor-1 (TTF-1), thyroglobulin, CK19, uman bone marrow endothelium marker-1 (HBME-1), Galectin-3, and BRAF by immunohistochemistry (IHC). TNM (tumor (T), node (N), and metastasis (M)) classified the tumour as pT4a since it had spread outside the thyroid capsule and infiltrated the inferior pharyngeal constrictor muscle. At the invasion location of the inferior pharyngeal constrictor muscle, the surgical margin was positive. According to the WHO classification of thyroid tumours published in 2022, the tumour associated with this lesion was pathologically identified as an infiltrative follicular variation of PTC. Multiple metastases (20 of 32) of the PTC, including unilateral Level V lymph nodes (pN1b), were seen in the dissected lymph nodes. Histological analysis of the yellowish-brown mass, on the other hand, revealed that the tumour cells had eosinophilic cytoplasm and rounded to oval-shaped nuclei with granular chromatin. Trabecular or solid growth of the tumour resulted in the formation of a fibrous peritumoral capsule. There were no typical nuclear findings that would indicate a PTC. It was discovered that the tumor's development pattern was primarily expanding. The tumour cells in the IHC test were positive for TTF-1 and thyroglobulin but negative for CK19, HBME-1, Galectin-1, and BRAF (V600E). According to the 2022 WHO classification, the tumour composing this lesion was pathologically determined to be minimally invasive FTC (mi-FTC) based on nuclear findings, the presence of capsular invasion, and IHC results. This case was ultimately determined to be a collision tumour of PTC and FTC, with each stage being pT4aN1b and pT3aN0 at surgery, respectively. A radioactive iodine therapy session was planned for the patient. She didn't want the adjuvant treatment, though. A recurrence tumour was clinically identified eight months following surgery as a quickly developing cervical lump. The woman refused further medical testing or treatment, and 8 months after surgery, she passed

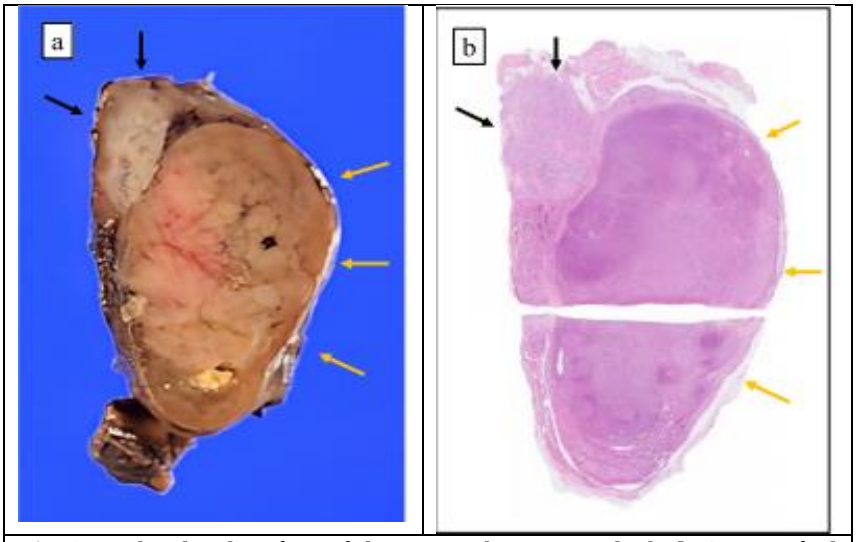


Fig. 2 a: The sliced surface of the tumour has a gross look. **b** A magnified view of a stained glass slide with hematoxylin and eosin. The PTC lesion is shown by a black arrow, while the FTC lesion is represented by a yellow arrow.

away due to a recurring tumour. The immediate cause of death was determined to be suffocation caused by airway constriction brought on by tumour development.

Discussion:

A collision tumour is defined as a neoplastic lesion made up of two or more different cell populations that preserve their individual boundaries. As a result, the current instance is categorically classified as a collision tumour. It is highly uncommon for PTC and FTC to coexist. In 4 cases, genetic changes have been examined. The genetic mutation most often found in PTC is the BRAF (V600E) mutation. The mutation that occurs the most frequently is NRASQ61R; BRAF and RAS mutations are mutually exclusive [(1)]. Similarly, in a study by Cracolici V et al showed BRAF V600E mutation in the initial papillary cancer and NRAS Q61R mutation in the primary follicular carcinoma and bone metastases [(3)]. Further in a study by Adam Stenman et al showed a FTC with a somatic Q61R NRAS mutation is growing next to a PTC with a BRAF mutation [(4)].

Conclusion:

It is extremely uncommon for PTC and FTC collision tumours to occur, and even fewer examples have been studied genetically. By doing an immunohistochemical and genetic analysis during a pathological examination, the current case was correctly identified. The PTC lesion's TERT promoter mutation was consistent with the cancer's aggressive behaviour.

Through pathological investigations utilising Immunohistochemistry (IHC) and genetic studies, a collision tumour comprising papillary thyroid carcinoma (PTC) and follicular thyroid carcinoma (FTC) was effectively identified.

References:

1. Kawasaki K, Kai K, Tanaka N, Kido S, Ibi A, Minesaki A, Yamauchi M, Kuratomi Y, Aishima S, Nakashima M, Ito M. Collision tumor of a papillary and follicular thyroid carcinoma: a case report. Thyroid Res. 2023 Aug 7;16(1):24. doi: 10.1186/s13044-023-00167-3. PMID: 37544981; PMCID: PMC10405457.

2. Feng JW, Ye J, Hu J, Liu SY, Jiang Y, Hong LZ. Synchronous papillary thyroid carcinoma and follicular thyroid carcinoma: case report and review of literature. International Journal of Clinical and Experimental Pathology. 2020;13(11):2767.

3. Cracolici V, Mujacic I, Kadri S, Alikhan M, Niu N, Segal JP, Rosen LE, Sarne DH, Morgan A, Desouky S, Cipriani NA. Synchronous and metastatic papillary and follicular thyroid carcinomas with unique molecular signatures. Endocrine Pathology. 2018 Mar;29:9-14.

4. Stenman A, Kjellman M, Zedenius J, Juhlin CC. Synchronous lateral lymph node metastases from papillary and follicular thyroid carcinoma: case report and review of the literature. Thyroid Research. 2022 Feb 4;15(1):1.

This scientific input is prepared from the Department of Medical Services, an initiative of M/s Micro Labs Limited under the aegis of Micro Knowledge Academy. The information contained herein is for education purpose only. The content is developed by compiling information from various authentic and published literatures. Although great care has been taken to assure the accuracy of the publication, M/s Micro Labs Limited shall not be responsible or in any way liable for any inaccuracy, errors, or omissions resulting from negligence or otherwise howsoever or any consequences arising there from. In spite of best efforts, the information in this publication may become outdated over time. M/s Micro Labs Limited shall not be responsible in any manner whatsoever, for any action taken, opinions expressed, advice rendered or accepted, any direct, incidental, special or consequential loss and damage caused on the basis of any material or information presented in this publication / update.