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Original Research Article

Clinicopathological and Radiological Study of Thyroid Swelling

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Abstract

Aim: The aim of the present study was to correlate between clinical findings and ultrasonography findings.

Methods: The prospective study of patients who attended the OPD in the Department of ENT, from September 2017 to September 2019 Patna Medical College and Hospital, patna for management of thyroid swelling was conducted. 52 patients were included in the study.

Results: Age wise distribution of 52 cases in our study shows maximum incidence of thyroid swelling in age group between 30-40 Years. In the present series the ratio of female to male is 4.77:1. We had 43 female patients and 09 male patients. The duration of swelling ranges from 1 month to 12 years. The chief complaints in the study were swelling in front of the neck. The other complaints being hoarseness of voice, difficulty in swallowing (Dysphagia), clinically evident hyperthyroidism founding 6 cases (11.5%) & evidence of hypothyroidism found in 3 cases (5.8%). Thyroid swelling was tender in one case. Fixity and cervical lymphadenopathy found in 5 cases and 2 cases respectively.

Conclusion: Thyroid swellings are not an uncommon problem. It is no longer justified to reset all thyroid nodules and a more selective surgical policy should be followed. The technical problems and the difficulties in interpretation of FNAC can be minimised with continued practice and experience. In case of strong suspicion of malignancy, a negative FNAC should be read with caution. In many such cases repeat FNAC or ultrasound guided FNAC can improve the accuracy.

Keywords: Goitre, Iodine deficiency, TIRAD score, Thyroid malignancy.

Introduction

Thyroid gland diseases are common and affect a large portion of general population. After diabetes mellitus, the thyroid gland is the most common gland to cause endocrine disorder. Disorders of the thyroid gland are the most common endocrine disease particularly in countries where iodine intake through diet is low. Normally thyroid gland is not palpable. The term “goiter” (from the Latin word gutter = the throat) is used to describe generalized enlargement of thyroid gland. Disorders of thyroid gland present with either an alteration of hormone secretion or as enlargement (increase size) of the thyroid gland. Thyroid disease is the most common endocrine disorder. Thyroid swelling is a problem of extensive magnitude all over the world. In India about 170 million people suffer from thyroid disease. [1] Thyroid disease is the condition impairing the function of thyroid. Normally thyroid gland is not palpable. In thyroid disease there will be swelling of thyroid gland and it becomes palpable. It causes pressure symptoms on trachea and oesophagus as well as cosmetic deformity also. Most common cause of thyroid swelling is deficiency of iodine. [2] The swelling of thyroid gland is the superficial and easily assessable to direct physical examination. Thyroid is troubled by various developmental, inflammatory and neoplastic disorders. [3]

In India multinodular goitre is very common because of the deficiency of iodine. Some swellings grow extremely slow such as multinodular goitre, solitary goitre, papillary and follicular carcinoma and some grows faster like anaplastic carcinoma. Among all thyroid carcinomas papillary carcinoma is most common accounting for 81%, followed by follicular carcinoma, medullary carcinoma, anaplastic carcinoma and lymphoma with incidence of 10%, 5%, 3% and 1% respectively. [4] Ultrasonography (USG) is safe, cost effective investigation of choice for determining the extent of thyroid nodule. It will help to differentiate between benign and malignant nodules. USG is very important in management of patients for solitary nodule. Thyroid USG is more sensitive than clinical palpation in identifying multiple nodules. TIRAD (Thyroid Imaging Reporting and Data System) is the gold standard for reporting the

thyroid nodules on ultrasonography. This utilizes a systematic scoring system for reporting of thyroid nodules. It helps users for directing about the use fine needle aspiration (FNA) or ultrasound for follow-up of suspicious nodules, and when to leave the nodules that are benign/not suspicious.

Thyroid swelling without any symptomatic manifestation is a common occurrence and could affect up to 5 to 20% patients in endemic areas where swelling may be noticed by family members, friends or physician. [5] It is generally associated with iodine deficiency. [6] Majority of thyroid swellings are nonneoplastic and do not always require surgical intervention. Less than 5% of thyroid nodules are malignant. [7] In clinical ENT practice neck swelling is one of the common presentations. Enlargement of thyroid accounts for the significant number of cases. [8] The prevalence of thyroid swelling is more than 40 million in India and more than 2 billion in the world. [9] Goiter rate among primary school children had been reported to be 4.83%. [10] They are 3-4 times more frequent in women than men. [11] An increase in prevalence rate in women was observed particularly in age group 21-30 years which might be associated with infertility, pregnancy and other complications. [12] Most of the thyroid nodules are benign and fewer than 5% of them are actually malignant. [13-15]

Investigation [16] FNAC is very important in determining the need for surgery. It plays crucial role in diagnosing neoplastic conditions, inflammatory and infective conditions. The Bethesda system which is widely accepted was framed for reporting thyroid cytopathology. [17] The aim of the present study was to correlate between clinical findings and ultrasonography findings.

Materials and Methods

The prospective study of patients who attended the OPD in the Department of ENT, from September 2017 to September 2019 Patna Medical College and Hospital, patna for management of thyroid swelling was conducted. 52 patients were included in the study.

Inclusion criteria:

- Willing patient who gave written consent were included in this study.
- Age group: 30 -55 years, both sex.
- All the patient with either incidentally detected or evident thyroid swelling.
- Patients with clinically suspected thyroid diseases.

Exclusion criteria:

- All patients with previous FNAC or Biopsy proven diagnosis
- Seriously ill with other morbidities and non-consenting patients.
- Pregnant women with thyroid swellings.
- Patients not willing to undergo ultrasonography.

Methodology:

Detailed history of the patients was taken and patients were thoroughly examined and investigated. Special emphasis was given on duration, onset, rate of growth, sudden change of size, pain, family history, radiation exposure, history of drug intake, food habits. Patients were also enquired about symptoms of hypothyroidism and hyper thyroidism. Any change of voice or presence of dyspnea, dysphgia was also rated. This was followed by general examination, local and systemic examination carefully. Thyroid nodule was examined carefully-size, shape, site, consistency, mobility, fixity to surrounding structures were noted. A careful search for palpable cervical lymph node was made and carotid pulsation was checked on both sides. This was followed by indirect laryngoscopy to know the vocal cord status.

Each patient was investigated to confirm our clinical impression as well as to assess fitness for general anesthesia. T3, T4, TSH assay was done routinely in all cases. This was followed by Ultrasonography and FNAC of the swelling. All patients were taken to the Radiology department, for ultrasound examination of the neck. Thyroid sonography was performed on the patient, in a supine position with extended neck. Some patients were examined in a sitting posture. Sonography was performed with a transducer having a frequency of 7.5 MHz. The thyroid gland was examined thoroughly in both transverse and longitudinal planes. Imaging of lower poles was done during swallowing also. Imaging also included the region of carotid artery and jugular vein to identify the enlarged cervical lymph nodes. Neck X-Ray was done only in cases of tracheal compression or deviation.

The patient was placed in a supine position with neck extended. The nodule was palpated and fixed between fingers and trachea. The overlying skin was cleaned with spirit and povidone- iodine. No local anaesthesia was used. The lesion was punctured with a 23 g needle fitted on a10 ml disposable syringe. Suction was applied manually and the needle was moved back and forth within the lesion and the material was as pirated in to the needle. The contents of the needle were spread on a glass slide, dried or fixed and stained.

Blood for hemoglobin, TC, DC, ESR, Sugar (FBS and PPBS), Urea, Creatinine, Chest X-Ray, and ECG were done in every patient, who were advised surgery, as part of general anaesthesia (GA) fitness. Any co-morbid conditions like hypertension and diabetes were controlled pre-operatively.

Counselling of the patient, regarding possibility of iatrogenic hoarseness of voice was done pre-operatively (particularly) in cases where subtotal/near-total/ total thyroidectomy was planned). Follow-up of patient, were done after 2 weeks, 1 month, 3 months and 6 months and then at 6 monthly interval.

Data Collection

Data was collected on individual basis by filling of the form by using proforma which was recorded & compiled using Microsoft excel data sheet.

Results

Table 1: Distribution of thyroid swelling according to age and sex

Age in Years	Male	Female	Total	Percentage
30 - 40	05	22	27	52.0
41 - 50	03	16	19	36.5
51 - 55	01	05	06	11.5
Total	09	43	52	100

Age wise distribution of 52 cases in our study shows maximum incidence of thyroid swelling in age group between 30-40 Years. In the present series the ratio of female to male is 4.77:1. We had 43 female patients and 09 male patients.

Table 2: Duration of swelling

Duration of swelling	Number of cases	Percentage of Cases
Below 1 year	09	17.3
>1 to < 3 years	28	53.8
>3 to <6 years	12	23.1
Above 6 years	03	5.8
Total	52	100

The duration of swelling ranges from 1 month to 12 years.

Table 3: Clinical Findings

Clinical Features	No. of Cases	Percentage of Cases
Swelling	52	100
Dyspnoea	00	00
Dysphagia	01	1.9
Hoarseness	03	5.8
Evidence of Hyperthyroidism	06	11.5
Evidence of Hypothyroidism	03	5.8
Tenderness	01	1.9
Fixity	05	9.6
Cervical lymphadenopathy	2	3.8

The chief complaints in the study were swelling in front of the neck. The other complaints being hoarseness of voice, difficulty in swallowing (Dysphagia), clinically evident hyperthyroidism founding 6 cases (11.5%) & evidence of hypothyroidism found in 3 cases (5.8%). Thyroid swelling was tender in one case. Fixity and cervical lymphadenopathy found in 5 cases and 2 cases respectively.

Table 4: Location of thyroid swelling (clinical)

Side	No. of Cases	Percentage of Cases
Right lobe	28	53.8
Left lobe	11	21.2
Right lobe & Left lobe	10	19.2
Right lobe & Left lobe & Isthmus	03	5.8

The position of thyroid swelling noted clinically in all cases. 53.8% of patients had right lobe swelling, 21.2% had left lobe swelling. In 19.2% patients there were involvement of both lobes and in 5.8% cases entire thyroid gland were involved.

Table 5: Consistency of thyroid swelling (clinical)

Consistency	Benign	Malignant	Total no cases	Percentage
Soft	04	00	04	7.7
Firm	33	08	41	78.8
Hard	01	06	07	13.5
Total	38	14	52	100

Consistency of the thyroid swellings were noted during clinical examination. Majority (80%) of the lesion were firm on palpation. Malignant lesions were found to be firm in 8 cases and hard in 6 cases. 13.5% of firm nodule

in our study proved malignant. Hard nodules were mostly malignant. There was no incidence of malignancy in soft swellings in our series.

Table 6: Ultrasonographic Finding

Category	No. of Cases	Percentage of cases
A. Solid Lesions	41	78.8
1.Uninodular lesion	20	
a. Hypoechoic	13	
b. Isoechoic	05	
c. Hyperechoic	02	
2.Multinodular lesion	12	
a. Hypoechoic	08	
b. Isoechoic	03	
c. Hyperechoic	01	
3. Diffuse lesion	09	
a. Hypoechoic	03	
b. Isoechoic	05	
c. Hyperechoic	01	
B. Cystic Lesions	04	7.7
a. Uninodular, hypoechoic lesions	02	
b. Uninodular, anechoic lesions		
c. Multinodular, hyperechoic lesions	01	
	01	
C. Mixed Lesions	07	13.5
a. Solitary Complex Cyst	05	
b. Multiple complex cysts	02	
D. Other Features		
1. Heterogenous echotexture	12	23.1
2. III define margin	02	3.8
3.Cervical Lymphadenopathy	01	1.9
4. Undected right lobe	01	1.9
5. Fine punctuate calcification	02	3.8

In the present study 41 cases were found to be solid lesion, 4 cases were cystic lesion, 7 cases were mixed lesions. Among solid lesions majority (20 cases) were uninodular lesion, others are multinodular lesion (12 cases) and diffuse lesion (9 cases). Regarding echogenicity . 4 cases of cystic lesions and majority of solid lesions (24 cases) are hypoechoic, 13 cases found to be Isoechoic, 4 cases were hyperechoic and two cases were anechoic simple cyst. Total number of multi-nodular lesion was 12 cases, among which 08 cases were solid lesion, a single case was cystic lesion and 2 cases were multinodular complex cyst. In our study 6 cases of complex cyst found among which 5 are solitary and 2 are multiple lesions. Heterogeneous echo texture found in 13 cases (Follicular adenoma – 4, collidgeitor – 3, papillary carcinoma -5, Follicular carcinoma – 1). Ill-defined margin found in 3 cases and all 3 proved to be papillary carcinoma later. In 2 cases associated cervical lymphadenopathy found; among them in one case there was solitary cervical lymphnode and in the other case multiple cervical lymph nodes were present. In one case right lobe was undetected due to previous surgery.

Table 7: Size of thyroid swelling – as determined by USG

Transverse diameter of the thyroid swelling	No. of cases	Percentage of cases.
1. >1 cm to <3 cm	32	61.5
2. >3 cm to < 5 cm	11	21.2
3. >5 cm to < 7 cm	07	13.5
4. above 7 cm	02	3.8
Total	52	100

Size of the thyroid swelling was assessed clinically first and later on confirmed by ultrasonography. High resolution ultrasonography provided accurate size of thyroid swellings and corrected some inaccuracies of clinical measurements. Majority of swellings having diameter between 1 to 3 cm (61.5%). Long standing cases attain bigger diameter. In multinodular cases diameter of the largest nodule were taken.

Table 8: FNAC Finding

FNAC	No. of cases	Percentage of cases
1. Colloid goiter	31	59.7
2. Colloid goiter with cystic degeneration	2	3.8
3. Follicular neoplasm	8	15.5
4. Papillary carcinoma	6	11.5
5.Hashimoto's (Autoimmune) thyroiditis	1	1.9
6. Granulomatous thyroiditis	1	1.9
7. Hurthle cell neoplasm	2	3.8
8. Benign cystic lesion	1	1.9
Total	52	100

FNAC was done in all cases in our series and cytology was studied from aspirate. Majority cases were diagnosed as colloid goiter (59.7%), cystic degeneration noted in 2 cases of colloid goiter. Next most common FNAC diagnosis were papillary carcinoma 11.5%and follicular neoplasm was15.5% .Out of 10 cases of papillary carcinoma in our series, 6 cases (60.0%) directly diagnosed by FNAC. Hurthle cell neoplasm was found in 3.8% cases. 1cases (1.9%) diagnosed as Hashimoto's thyroiditis and 1 case (1.9%) diagnosed as granulomatous thyroiditis. One case of purely cystic lesion was detected.

Table 9: Histopathological Diagnosis

Histopathological diagnosis	No. of cases	Percentage of cases
1. Colloid goiter	18	40.0
2. Follicular adenoma	15	33.4
3. Papillary carcinoma	8	17.8
4. Follicular carcinoma	2	4.4
5. Hashimoto's thyroiditis	1	2.2
6. Cystic lesion	1	2.2
Total	45	100

In our study, 45 cases were treated surgically and rest of the cases was treated conservatively. Among the 13 patients treated conservatively 10 cases were colloid goiter, and one each case of Hashimoto's thyroiditis, granulomatous thyroiditis and benign cystic lesion. Mode of conservative management was either thyroid hormone replacement or antithyroid drugs. The benign cystic lesion was treated by simple aspiration.

Discussion

Management of thyroid enlargement most depends on FNAC and ultrasound finding, whether it is benign or malignant. Benign condition such as goiter are mainly managed by medical and surgical treatment depends upon extent of enlargement, compressive symptom and for cosmetic purpose. Mostly malignant condition was treated by surgical removal of thyroid gland.

Majority of the patients with nodular goiter has been reported to be in the age group of 30-35 years (Hamming JF 1990) [18], (Caruso and Mazzaferi 1991). [19] Majority cases in our study belong to 30-40 years age group (52%); the next most common age group is 41-50 years (36.5%). And 11.5% of patients were between 51-55years of age group. There were 43 females and 9 males in our series, with Female; male ratio being 4.77:1 sex ratio in various part of the world varies but females outnumber males in almost all series. Majority of swelling found in right lobe (53.8%). Not a single case of isolated isthmus involvement is recorded. Similar observation was made by Miller (1955), Perlmutter and Stater (1956), Sachlein et al (1974),Psarras et al (1972). [20] In our series majority of malignant swelling were firm and most of the hard swelling were malignant. Majority of firm swelling were benign (76.9%) and one benign swelling felt hard because of calcification. These finding correlate were with findings of Bhansali et al (1974). [21] In our study, majority of the nodules are of size 1-3cm (61.5%). Nodules less than 1cm in diameter were usually nonpalpable. Most of our cases were Euthyroid (78.8%), Kapur et al (1982) [22] showed that patients with thyroid cancer rarely have abnormalities in Serum T3, T4, TSH levels and an abnormal concentration of these decrease the likelihood of malignancy in a thyroid nodule. In our series, one patient (among three) of Hashimoto's thyroiditis had hypothyroidism.

Ultrasonography was done in all cases 41.54% cases reaveled hypoechoic solid mass. Classical feature of benign thyroid swelling is homogeneous internal echo without disruption of sonolocent halo around the nodule (Katz JF et al 1984) [23] (Cole-Beuglet C et al 1983). [24] On the other hand hypoechoic solid nodule with heterogenous internal echoes and irregular border is regarded as

malignant. Fine punctate calcification depicted by USG is also suggestive of malignancy (Russ DS 1991). [25] In our series, among the 10 malignant cases, only 8 cases had typical sonological features of malignancy. With recent high resolution transducer as well as Doppler flow imaging, high accuracy in differentiating benign from malignant lesion has been reported (Shimamoto K et al 1993). [26] USG has high accuracy in determining the size of the nodule but regarding the spread of the thyroid tumour beyond thyroid capsule, it has low sensitivity except, prethyroid and sternocleidomastoid muscle invasion. Regarding lymphnode metastasis in case of thyroid tumour

Ultrasonography guided Fine needle aspiration cytology has become the investigation of choice in proper diagnosis of thyroid swelling with a reported incidence of more than 90% sensitivity and specificity in diagnosing thyroid cancer (Gharib et al 1997) [27], (Hamburger J et al 1994). [28] In our series the sensitivity of FNAC in diagnosing thyroid carcinoma is 62% and specificity is 100% since no benign nodule was erroneously labelled as malignant. We found the accuracy to be 88%. Similar results are found in other studies, i.e., 90.9% (Agarwal et al 1995). [29] Some cases of colloid goiter has been diagnosed as follicular neoplasm and vice versa; in our study (on FNAC) 6 cases of colloid goiter as diagnosed by FNAC were subsequently shown to be follicular adenoma and one case of follicular neoplasm as revealed by FNAC were shown to be colloid goiter late on (by histopathology). It is possible that aspiration from these cellular areas may be the case of misinterpretation (Caraway NP et al 1993). [30] The greatest problem encountered in FNAC is the distinction between follicular carcinoma and follicular adenoma. Therefore the authorities on the subject recommended that such lesions be classified as follicular neoplasm and must be subjected to the histopathological examination (Kendal CH 1989). [31]

In our series, 4 cases of papillary carcinoma were missed on pre operative FNAC. Chance of missing papillary carcinoma is high when the lesion is cystic. The cause of false negative reports in cystic papillary carcinoma are lack of cytological pleomorphism as result of the needle missing the lesion particularly when the lesion is small or the sampling is inadequate (Nilsson G et al 1970). [32] Since a false negative report can give a false sense of assurance to the patient and clinician and may be evaluated individually with the knowledge of clinical history and physical examination, ultrasound report. In case of strong suspicion of malignancy, FNAC should be reported on the patient subjected to surgical exploration. Rate of malignancy as revealed by histopathology is 23.08%, various reports (15.2% Abu Eshy et al 1995) [33], (11-20% Kendall & Condon 1969) [34] documented nearly similar incidence.

We have few limitations in our set up. We do not have facilities for frozen section analysis. Facility for radioiodine ablation is also not available here. Most of the patients are poor socio-economic status. These factors modified our treatment policy in some cases particularly in thyroid carcinoma patients.

Conclusion

Thyroid swellings are not an uncommon problem. It is no longer justified to reset all thyroid nodules and a more selective surgical policy should be followed. The technical problems and the difficulties in interpretation of FNAC can be minimised with continued practice and experience. In case of strong suspicion of malignancy, a negative FNAC should be read with caution. In many such cases repeat FNAC or ultrasound guided FNAC can improve the accuracy. USG of thyroid and adjacent neck structures can be very valuable, Glandular size, symmetry and presence of nodules can be well evaluated with ultrasound. Ultrasound is poor in differentiating benign from malignant processes. Its ability to distinguish architectural changes, solitary nodules and adenomatous goiter could be used in addition to physical examination. Ipsilateral thyroid lobectomy and isthmusectomy is the minimal surgical procedure for a thyroid nodule restricted to one lobe. In case of malignancy choice of surgery between near total or total thyroidectomy. Lastly, a thyroid cancer registry should be maintained both at regional and national levels to keep the proper record and to assist future epidemiological studies.

References

1. Park K. Park's textbook of preventive and social medicine. Preventive Medicine in Obstet, Paediatrics and Geriatrics. 2005.
2. Krukowski Zygmunt J (2004) The thyroid and thyroglossal duct. Bailey and Love's short practice of surgery, 24th edn. London, pp 776–804.
3. Vander JB, Gaston EA, Dawber TR. The significance of nontoxic thyroid nodules: final report of a 15-year study of the incidence of thyroid malignancy. Annals of internal medicine. 1968 Sep 1;69(3):537-40.
4. Ramsden J, Watkinson J (2008) Thyroid cancer. In: Glesson M, Browning G, Burton M (eds) Scott Browns otorhinolaryngology, head and neck surgery, 7th edn. Hodder Arnold, London,pp 2663–2701.
5. Gharia Amit A, Agravat Amit H, Dhruva Gauravi A. Thyroid Cytology Evaluation By Bethesda System A Two Year Prospective Study. Int J Res Med. 2016;5(3):1-6.

6. Alkabban FM, Patel BC. Goiter, Nontoxic. In: Stat Pearls. Treasure Island (FL): Stat Pearls Publishing; 2018.
7. Krohn K, Fuhrer D, Bayer Y, Eszlinger M, Brauer V, Neumann S, Paschke R, Führer-Sakel D. Molecular pathogenesis of euthyroid and toxic multinodular goiter. Endocrine reviews. 2005 Jun 1;26(4):504-24.
8. Sclabas GM, Staerkel GA, Shapiro SE, Fornage BD, Sherman SI, Vassillopoulou-Sellin R, Lee JE, Evans DB. Fine-needle aspiration of the thyroid and correlation with histopathology in a contemporary series of 240 patients. The American Journal of Surgery. 2003 Dec 1;186(6):702-10.
9. Makwana C, Lakum NR, Makwana H, Joshi J, Agnihotri A. Clinicopathological correlation of serum TSH level in patients with thyroid nodul. Int JMed Sci Public Health. 2016;5(2):332-6.
10. Unnikrishnan AG, Menon UV. Thyroid disorders in India: An epidemiological perspective. Indian journal of endocrinology and metabolism. 2011 Jul;15(Suppl2):S78.
11. Mamun A, Alam Z, Haque R, Hasan DM. Study of Pathological Variations of Solitary Thyroid Nodule. Global J Med Res. 2014; 24(3):9-16.
12. Yeung MJ, Serpell JW. Management of the solitary thyroid nodule. Oncologist. 2008;13(2):105–12.
13. Makwana NR, Shah VR, Unadkat S, Shah HD, Yadav S. Goiter prevalence and current iodine deficiency status among school-age children's years after the universal salt iodization in Jamnagar district, India. Thyroid Research and Practice. 2012 May 1;9(2):40-4.
14. Geisin KR, Stanley MW, Raab SS, Silverman JF, Abati A. Modern Cytopathology, Churchill Livingstone, 2004.
15. Jameson JL. Disorders of the thyroid gland. In: Harrison's Principles of Internal Medicine, FauciAS, Branunwald E, Kasper DL, eds. McGraw-Hill,New York, NY, USA, 17th edition, 2008: 2224–2247.
16. Burch HB, Burman KD, Reed HL, Buckner L, Raber T, Ownbey JL. Fine Needle Aspiration of Thyroid Nodules Determinants of Insufficiency Rate and Malignancy Yield at Thyroidectomy. Acta cytologica. 1996 Dec 1;40(6):1176-83.
17. Rosen IB, Wallace C, Strawbridge HG, Walfish PG. Reevaluation of needle aspiration cytology in detection of thyroid cancer. Surgery. 1981 Oct 1;90(4):747-56.
18. Hamming JF, Goslings BM, Van Steenis GJ, van Ravenswaay Claasen H, Hermans J, Van de Velde CJ. The value of fine-needle aspiration biopsy in patients with nodular thyroid disease divided into groups of suspicion of malignant neoplasms on clinical grounds. Archives of internal medicine. 1990 Jan 1;150(1):113-6.
19. Caruso D, Mazzaferri EL. Fine needle aspiration biopsy in the management of thyroid nodules. The Endocrinologist. 1991 Jun 1;1(3):194-202.
20. Psarras A, Papadopoulos SN, Livadas D, Pharmakiotis AD, Koutras DA. The single thyroid nodule. Journal of British Surgery. 1972 Jul;59(7):545-8.
21. Bhansali, 1989; Islam. M. Jain, P.K. Gupta, R.J. Somatic Embryog'enesis in Woody PlantsNewton – 2013.
22. Kapur & Sarin (1982) Solitary thyroid nodule. Indian Journal of ... Marquesee E., Benson C.B., prates M.C-2002.
23. Katz JF, Kane RA, Reyes J, Clarke MP, Hill TC. Thyroid nodules: sonographic-pathologic correlation. Radiology. 1984 Jun;151(3):741-5.
24. Cole-Beuglet C, Goldberg BB. New high-resolution ultrasound evaluation of diseases of the thyroid gland: A review article. JAMA. 1983 Jun 3;249(21):2941-4.
25. Russ DS: Evaluation of thyroid nodules. J Nucl Med. 32: 2181, 1991.
26. Shimamoto K, Endo T, Ishigaki T, Sakuma S, Makino N. Thyroid nodules: evaluation with color Doppler ultrasonography. Journal of ultrasound in medicine. 1993 Nov;12(11):673-8.
27. Gharib H. Fine-needle aspiration biopsy of thyroid nodules: advantages, limitations, and effect. In Mayo Clinic Proceedings 1994 Jan 1 (Vol. 69, No. 1, pp. 44-49). Elsevier.
28. Hamburger JI. Diagnosis of thyroid nodules by fine needle biopsy: use and abuse. The Journal of Clinical Endocrinology & Metabolism. 1994 Aug 1;79(2):335-9.
29. Agarwal SJ, Surgoncol 1995 Mar; 58: 168-172.
30. Caraway NP, Sneige N, Samaan NA. Diagnostic pitfalls in thyroid fine-needle aspiration: a review of 394 cases. Diagnostic cytopathology. 1993 May;9(3):345-50.
31. Kendall CH. Fine needle aspiration of thyroid nodules: three years' experience. Journal of clinical pathology. 1989 Jan 1;42(1):23-7.
32. Nilsson G, Söderström N, Telenius M. Diagnosing thyroid carcinoma. The Lancet. 1970 Sep 26;296(7674):666-7.
33. Abu Eshy SA, Khan AR, Khan GM. Coll Surg Edinburgh 1995; Oct. 40: 310-12.
34. Kendall L, Condon R. Prediction of malignancy in solitary thyroid nodules. The Lancet. 1969 May 31;293(7605):1071-3.