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Systematic review on ultrasonography guided FNAC in detection of regional lymph node metastasis in head and neck carcinoma.

systematic review

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Introduction

Regional metastasis to the cervical lymph nodes is one of the most important tumour related prognostic factors in head and neck carcinoma. The risk of occult neck node metastasis can be reduced by an accurate staging method, provided ultrasonography guided fine needle aspiration cytology (USG-FNAC) is able to detect significant percentage of small non-palpable lymph node metastasis. The neck has traditionally been assessed by clinical examination, but studies that compared clinical examination with histology have shown that clinical examination of the neck for lymph nodes has a low sensitivity and specificity with false negative results ranging from 15%-25%. The detection of a small lymph node of 1 cm³ or less is easily missed out on clinical examination which may have billions of tumour cells. USG-FNAC has been used as an accurate technique for the assessment of the clinically undetectable lymph node metastasis (N0). The importance of systematically reviewing USG-FNAC in head and neck cancer were to upstage of N0 neck thus ensuring timely treatment and provide more certainty that the neck is really free of metastasis.

Objectives

Review the published literature of assessment of head and neck carcinoma with or without clinically detectable regional cervical lymph nodes using USG-FNAC using Quality Assessment of Diagnostic Accuracy Studies (QUADAS) tool.



Fig. 1: Lip carcinoma



Fig. 2: Palatal carcinoma



Fig. 3: Carcinoma of orofacial region (buccal mucosa, skin)

Fig. 4a: USG of parotid tumour (a)



Fig. 4b: USG of parotid tumour (b)

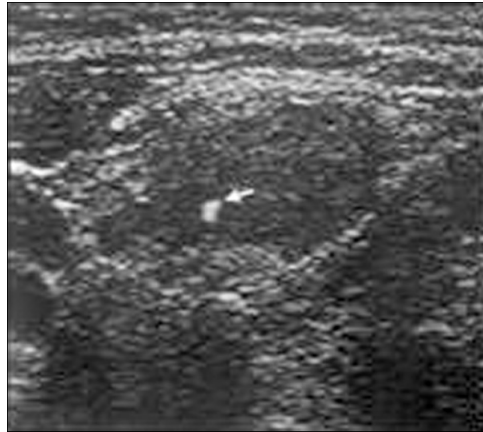


Fig. 4c: USG of parotid tumour (c)

Material and Methods

Materials:

Indexed sites and non indexed journals were used to identify published data for the studies on USG-FNAC in head and neck carcinoma. Thirty-five such published articles were retrieved and reviewed.

Criteria for considering studies for this review:

The search was not limited to any particular type of study design (i.e. randomized controlled trials) however, we employed certain filters, namely:

- a. studies of diagnostic accuracy in head & neck carcinoma cases.
 - b. ultrasonography guided FNAC performed to assess the lymph node status
- Ultrasonography guided FNAC is evaluated as a single test against an acceptable reference standard method (histopathology). CT & MRI comparative studies were not included.

Criteria for not considering studies:

Studies that address specific anatomical, metabolic aspects of USG-FNAC.
Studies that focus on specific technical aspects of ultrasonography.

Search methods for identification of studies:

Electronic searches

Cochrane Library (until March, 2008)
MEDLINE (until March, 2008)
CANCERLIT (until March, 2008)

Other sources

Hand searching on Non Indexed Indian journals

Reference lists

Additional studies by searching the reference lists of included trials and systematic reviews identified.

Methods:

Selection of studies:

Two reviewers (JR and AS) independently assessed the titles and abstracts of reports of trial identified by the electronic search. Full text hard copies were obtained for studies that appeared to fulfill the selection criteria and for studies where there was any doubt. Inter-rater agreement for study selection was measured using the kappa statistics. In case of discrepancy, the opinion of the third reviewer (SKN) was sought in order to reach a consensus.

Data extraction and management:

Data were independently extracted by the reviewers and cross-checked. A standard data extraction form was used, collection the key data (methods, participants, interventions, outcomes, results and notes).

Assessment of methodological quality of included studies:

Two reviewers (JR and AS) assessed the methodological quality of each included study using the Quality Assessment of Diagnostic Accuracy Studies (QUADAS) tool developed by the NHS Centre for Reviews and Dissemination at the University of York, UK. The QUADAS is structured in 14 questions, each of which should be answered "yes", "no", or "unclear" and aim at evaluating the presence of spectrum bias, bias associated with the choice of reference standard, disease progression bias, verification bias, review bias, clinical review bias.

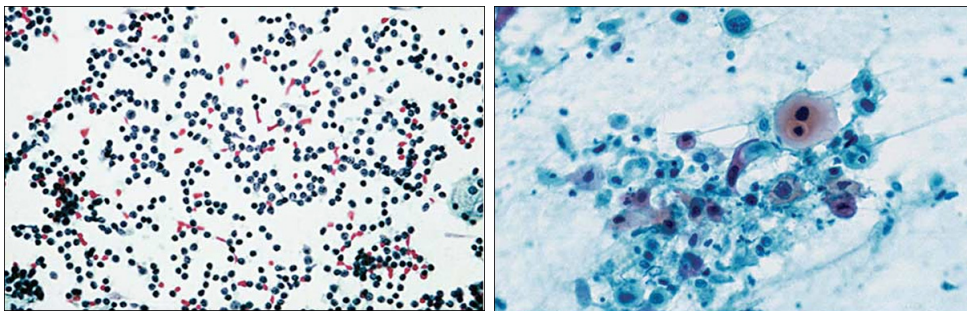


Fig. 5a-b: Fine needle aspiration cytology findings

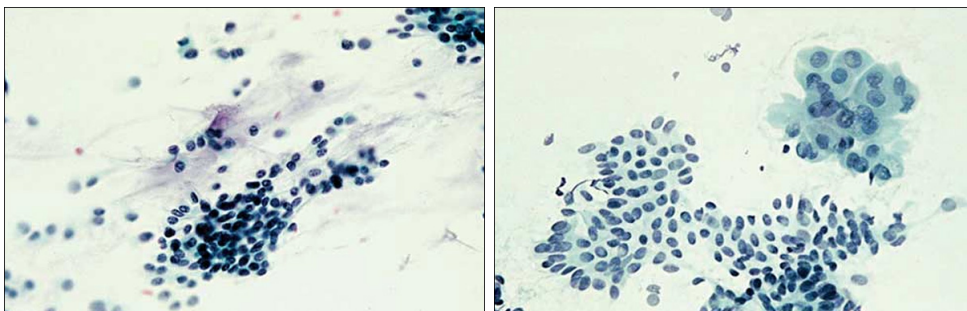


Fig. 5c-d: Fine needle aspiration cytology findings

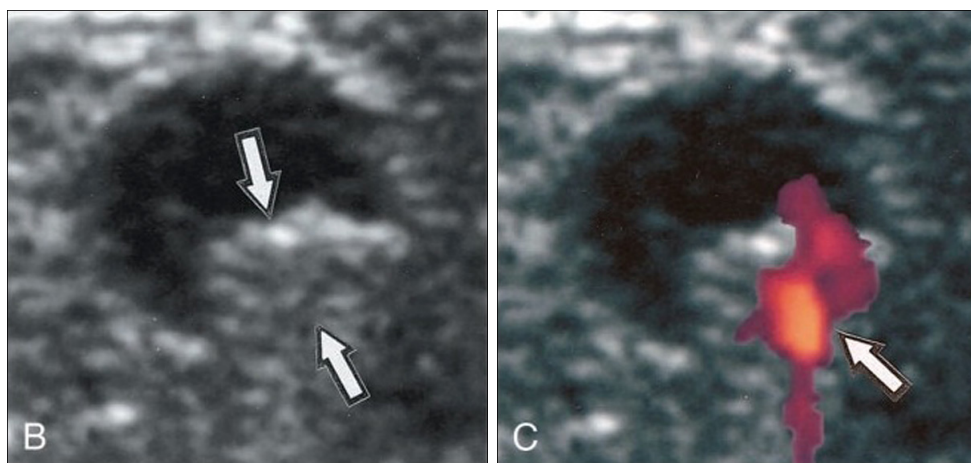


Fig. 6a-b: Doppler ultrasonography for regional lymph node metastasis

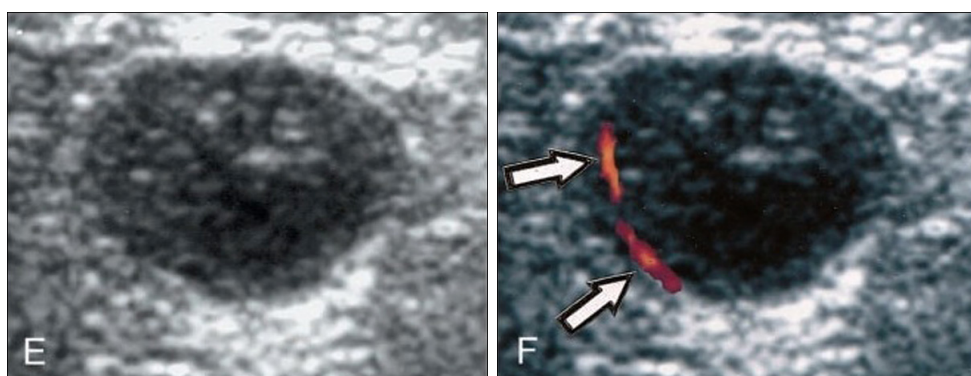


Fig. 6c-d: Doppler ultrasonography for regional lymph node metastasis

Results

Out of 35 retrieved articles, 10 fulfilled the inclusion criteria and were subjected to review using the QUADAS tool. Inter-rater agreement for selection of articles was 0.91. Inter-reviewer agreement for assessing the methodological quality of each included study ranged from 0.8 to 1.0. Six of the studies were retrospective and 4 were prospective. All the studies reported the total number of patients involved in the study and most of the studies also reported their age and sex. In place of conventional ultrasonography, Chikui et al 2000 and Eida et al 2003 assessed the lymphnodes with Power Doppler Sonography and Hayashi et al 2003 and Eida et al 2003 also used CT. Five studies also assessed the cytological findings of the lymphnodes. Evaluation of USG-FNAC showed the following ranges: sensitivity 58% - 89.2%, specificity 87% - 100% and accuracy 80% - 100%.

Literature

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Abbreviations

- USG-FNAC – UltraSonography Guided Fine Needle Aspiration Cytology
- QUADAS – QUality Assessment of Diagnostic Accuracy Studies
- LN – Lymph Node
- CT – Computerized Tomography
- MHz – Mega Hertz
- IV – Intra Venous
- Hz – Hertz
- ml/s – milliliter per second
- mm – millimeter
- kVp – kilo voltage potential
- mA – milliampere

This Poster was submitted by Dr. Jyotsna Rimal.


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Poster Faksimile:

Systematic review on ultrasonography guided FNAC in detection of regional lymph node metastasis in head and neck carcinoma

P: 05



Oral carcinoma

Background
 Regional metastasis to cervical lymph nodes is one of the most important tumour related prognostic factors in head and neck carcinoma. Studies comparing clinical examination of neck with histology: low sensitivity and specificity, false negative results ranging from 15% - 20%. Detection of small lymph node (<1cm²) is easily missed out on clinical examination.

Objective:
 Review the published literature of assessment of head and neck carcinoma with/without clinically detectable regional cervical lymph node using ultrasound guided fine needle aspiration cytology (USG-FNAC).

Implications:
 Upstage of NO neck, thus, ensuring timely treatment
 Provide more certainty that neck is really free of metastasis.

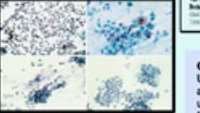
Materials:
 35 published articles
 Indexed journals (MEDLINE, CANCERLIT, EMBASE)
 Non-indexed Journals

Inclusion criteria:
 Studies of diagnostic accuracy in head and neck carcinoma
 Ultrasonography guided FNAC performed to assess the lymph node status
 USG-FNAC evaluated against acceptable reference standard method (Histopathology)
 USG-FNAC may be accompanied by CT/MRI.

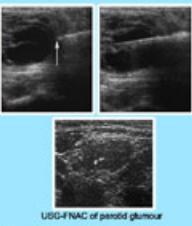
Method:
 2 reviewers independently assessed titles and abstracts of published articles
 Full text hard copies obtained for studies that fulfilled selection criteria
 Inter-rater agreement – 0.91
 Data independently extracted by reviewers and cross-checked
 Assesses methodological quality of each included study – Quality Assessment of Diagnostic Accuracy Studies (QUADAS)
 Inter-rater agreement – 0.8 to 1.0
 In case of discrepancy – opinion of 3rd observer

Study	Participants	Methods	Outcomes
Indrak et al, 2009, 30	49 patients Head and neck carcinoma	Prospective study USG - 2.5MHz, axilla - 21 gauge, by consultant radiologist, sterile protocol, cytologic diagnosis - consultant pathologist	11 patients - Lymph node ESM benign on USG - no FNAC done, 33 patients -USG-FNAC - only 4 of no diagnostic value, 3 - false negative, 2 - cytologically positive but USG -ve
Heath et al, 2008, 300	18 patients, 9 men, 9 women Age: 24-60 yrs, T-stage cancer of range: I-IV	Retrospective study USG and CT USG - 3 experts, 10MHz with mechanical sector transducer CT - Initial, with contrast material IV at the rate of 1.5ml/s	Of 18 patients, 7 metastatic LN detected, remaining 11 patients, no metastatic LN, follow up for at least 1 yrs, Sensitivity per node USG - 100%, accuracy per node CT - 100%
Yu Ho, 2008, 101	147 patients, Head & neck cancer, USG - FNAC - 17 patients with 146 nodes	Retrospective study USG - 5.0MHz, linear array transducer, radiographic print - categorized lymph nodes - 1 - papillary, 2 - solid present	Sensitivity - 76% Specificity - 100% Accuracy - 89%
Chakraborty, 2008, 280	32 patients, 12 men, 20 women Head & neck cancer, age - 44-65 yrs, I-IV LN disease	Retrospective study Power Doppler Sonography Logic 700 with wide bandwidth (0-12 MHz) transducer by an expert USG & grey scale, 10MHz power Doppler	Background: 4 LN - 5 prior nodes, 2-4 were lower than LN level 1.9 for later & peripheral. Head (low) grey scale criteria for LN metastases revealed. Predictive criteria of metastatic LN absence of normal LN nodes. Color flow - low predictive value
Engelhardt, 2008, 200	34 patients, head & neck cancer	Retrospective study USG - 7.5MHz, linear array transducer, evaluation assisted - color Doppler 22/31 cases, multiple nodes aspirated, 17/31 aspirated	of 33 - correct diagnosis, 1 ESM - false +ve for cancer, 10 LN - negative for cancer, 10 LN - positive (highly suggestive); 23 LN - compression spaces 2.25 - 4mm. Sensitivity - 95.2%, specificity - 98.1%, accuracy - 94.3%
Shin et al, 2008, 190	18 patients, 17 men & 1 woman, neck disease & oral cancer	Prospective study Power Doppler ultrasonography & helical CT Power Doppler - Logic 700 with wide bandwidth (0 - 12 MHz) transducer, grey scale ultrasonography 10MHz, Doppler 10MHz & wall filter of 15/100Hz, by 2 radiologists. Helical CT - Collimation 3mm, pitch 1.1, 128 kVp/200mA	Power Doppler & helical CT combined. Sensitivity - 47%, Specificity - 98%, Accuracy - 100%. Positive predictive value - 100%, negative predictive value - 90%. Combination - improved results than single techniques.
Chow et al, 2007, 200	140 patients, solitary pleural lesions	Retrospective study USG - Cytopathologic & histopathologic studies compared to radiologic, negative, benign, malignant and non - neoplastic. Expert cytopathologist	Sensitivity - 77%, Specificity - 67%, Accuracy - 80%. Positive predictive value - 85%, negative predictive value - 77%
Chakraborty, 2007, 300	424 patients with thyroid nodules, 10 men, 380 women, age 13-82 yrs.	Retrospective study USG - 5.0MHz linear transducer by an expert, 177 patients - FNAC & 11 papillary nodules, 2 - pure nodules, cytological examination	Sensitivity - 85.5%, Specificity - 49%, Accuracy - 47%. Positive predictive value - 76.4%, Negative predictive value - 85.9%
Yamamoto, 2007, 100	289 lymphatic lesions of thyroid in 193 patients, age 14-88	Retrospective study USG - 2.2-10MHz linear array transducer by radiologist, results in - 18 years, axilla, tissue preserved	Sensitivity - 41%, Specificity - 98%, Accuracy - 49%. Screening test of choice in assessment of patients with visible disease of thyroid.
Yu Ho, 2006, 100	17 patients, Head & Neck cancer, average age - 47 yrs, treated cancer	Prospective study USG - 7.5MHz linear array transducer, evaluation done, after proposal	14/17 patients (82%) detected on USG-FNAC & 3 were clinically detected, 4 neck failures within 3 months after primary tumor resection, 7 failures between 4-7 months, 7 failures after > 7 months

Conclusion:
 Ultrasonography combined with FNAC has been found to be a highly accurate investigation for the assessment of cervical metastasis in patients with head and neck cancer. Experience and skill of the ultrasonographer and cytopathologist are equally important for good results. Additional information gained from USG examination and FNAC is valuable in diagnosis and follow up.



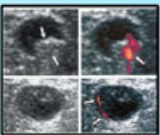
Cytology



USG-FNAC of parotid gland
 The QUADAS tool:
 Answered as 'yes', 'no', or 'unclear'

Item

- 1 Was the spectrum of patients representative of the patients who will receive the test in practice?
- 2 Were selection criteria clearly described?
- 3 Is the reference standard likely to correctly classify the target condition?
- 4 Is the time period between reference standard and index test short enough to be reasonably sure that the target condition did not change between the 2 tests?
- 5 Did the whole sample or a random selection of the sample, receive verification using a reference standard of diagnosis?
- 6 Did patients receive the same reference standard regardless of the index test result?
- 7 Was the reference standard independent of the index test?
- 8 Was the execution of the index test described in sufficient detail to permit replication of the test?
- 9 Was the execution of the reference standard described in sufficient detail to permit its replication?
- 10 Were the index test results interpreted without knowledge of the results of the index test?
- 11 Were the reference standard results interpreted without knowledge of the results of the index test?
- 12 Were the same clinical data available when test results were interpreted as would be available when the test is used in practice?
- 13 Were uninterpretable/intermediate test results reported?
- 14 Were withdrawals from the study explained?



Doppler ultrasonography