

has been reported to be useful where the volvulus appears as a constriction between dilated upper stomach and lower stomach body. This constriction termed the "peanut" sign loosens once the volvulus is treated.

Treatment of gastric volvulus has changed in recent decades.<sup>1</sup> Surgical treatment includes diaphragmatic hernia repair, division of bands, simple gastropexy, gastropexy with division of gastrocolic omentum (Tanner's operation), partial gastrectomy, gastrojejunostomy (Opolzer's operation) and repair of eventration of diaphragm. Open surgical reduction with or without gastropexy has been the traditional treatment. However, in view of the magnitude of surgical insult in a predominantly elderly population, a conservative management policy has often been pursued by some, particularly in chronic volvulus.<sup>1</sup> In our patients who were predominantly of younger age group and had chronic symptoms, surgical intervention in the form of treating the underlying cause and gastropexy appeared appropriate and effective. In recent years though, less invasive techniques such as percutaneous endoscopic gastrostomy (PEG) placement and laparoscopy surgery have become possible.<sup>3,4</sup> Recent reports also indicate successful treatment of eventration of diaphragm thoracoscopically.<sup>5</sup> Surgical repair however, is believed to be superior to PEG placement as the latter alone may not prevent recurrent volvulus.<sup>1</sup> Laparoscopic approach is reported to have fewer complications and significant reduction in hospital stay.<sup>4</sup> Hence, it may be particularly useful in treating elderly patients with significant co-morbidity who would have previously been treated conservatively.<sup>1</sup> In patients managed conservatively, the risk of future strangulation and death exists. Mortality rates of 30-50% have been reported for acute volvulus, the major cause of death being strangulation, leading to necrosis, perforation and hypovolemic shock.<sup>1,2</sup>

In summary, gastric volvulus is a rare but potentially fatal surgical emergency. Recurrent upper abdominal pain, vomiting, chest discomfort may suggest a possible diagnosis, which should be confirmed by contrast studies and or endoscopy. In younger age group diaphragmatic derangements appears to be the frequently encountered underlying cause. Surgical treatment of underlying cause and gastropexy has been effective in alleviating the symptoms and in preventing recurrence.

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Preoperative precision value of thyroid fine needle aspiration in thyroid surgical resection candidates

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The 4-7% prevalence of thyroid nodules in general population increases with age, although malignancies of the thyroid gland more frequently threaten both younger adults (under 21 years of age) and elderly people (>40 years of age). Approximately 5% of all thyroid nodules are malignant and papillary carcinoma is the most prevalent neoplasm, nevertheless, complete evaluation of every thyroid nodule is necessary.<sup>1</sup> To assess thyroid nodule, there are several options including thyroid function tests, radioactive scan, ultrasonography, and exploration and making pathologically diagnosis.

Practice guidelines suggest that an initial fine needle aspiration (FNA) is more diagnostically helpful and cost benefit than other types of exploration.<sup>2</sup> Fine needle aspiration is highly recommended for all palpable solitary or dominant nodules, independent of their size. Despite such guidelines, a recent study from the United States of America reported that in 1996, FNA was only used as the initial procedure in 53% of thyroid nodule cases<sup>3</sup> and it is still almost unfamiliar to use FNA in extensive number of patients and more unfamiliar to make decision on basis of FNA in underdevelopment countries similar to Iran. On the other hand, FNA is a powerful diagnostic tool in the hands of skilled operator and when interpreted by an

experienced pathologist. Mostly, low-skilled operators (even if the procedure is easy to learn) can affect the results. We decided to study the outcomes of FNA biopsy in one teaching hospital to determine the precision of this test in contrast to definite pathology diagnosis and clarify proportion of false positives and negatives.

Thyroid nodules of 59 patients were surgically resected at the Imam Hossein (Shahid Beheshti University) Hospital, Tehran, Iran from March 1995 to August 1998. We reviewed the records of these thyroidectomy patients retrospectively. Thyroidectomy was consisted of different types of lobectomy, isthmectomy, near total thyroidectomy, and total thyroidectomy. Interpreted FNA reports by a pathologist before surgery were reviewed. Inadequacy was defined as the inability of the pathologist to interpret the sample due to insufficient aspirated material. Malignant, benign, and suspicious (atypical cytologic characteristics that were believed to fall short of an equivocal diagnosis of malignancy) were also recorded due to pathology definitions and reports. Fine needle aspirations were performed by different physicians (residents, surgeons, and pathologists), using a 22-25 gauge needle attached to a 10-20 ml-syringe. Except for palpation maneuvers, operators did not use any supplemental imaging or other tools to find nodule location. Sensitivity (sens), specificity (spec), and accuracy were defined as

$$\text{Sensitivity} = \frac{\text{true positives}}{\text{true positives plus false negatives}}$$

$$\text{Specificity} = \frac{\text{true negatives}}{\text{false positives plus true negatives}}$$

$$\text{Accuracy} = \frac{\text{true positives plus true negatives}}{\text{total FNAs}}$$

Positive predictive value (PPV) and negative predictive value (NPV) were calculated through the following formulas

$$\text{PPV} = \frac{\text{true positives}}{\text{true positives plus false positives}}$$

$$\text{NPV} = \text{true positives} + \text{false positives}$$

The positive likelihood ratio (PLR) and negative likelihood ratio (NLR) were also considered as

$$\text{PLR} = \frac{\text{sens}}{1-\text{spec}}$$

$$\text{NLR} = \frac{1-\text{sens}}{\text{spec}}$$

Sensitivity, spec, PPV, NPV, PLR, and NLR were defined as precision indexes.

Calculating diagnostic test precision indexes, we dealt with suspicious samples in 2 different manners: (1) Excluding them in first step and (2) considering them as malignant tissues (most obscure form). Clearly we did not enter inadequate FNA biopsy samples in precision analysis.

Of the 59 patients, 46 (77.9%) were females and 13 (22.1%) were males. Mean age was 47 years and ranged from 14-81. Forty-eight (81.3%) patients reported a sense of neck mass or rarely more specifically described an increase in thyroid size as one of their major complaints. Dyspnea was experienced by 10 (16.9%), weight loss by 5 (8.5%), hoarseness by 2 (3.4%), and dysphagia by 2 (3.4%) of thyroidectomy patients. The thyroid nodule was detected in 49 (83.0%) patients in physical examination, whereas lymphadenopathy was registered in 5 (8.5%) and exophthalmia in 2 (3.4%). Fifteen (25.4%) patients had received medical treatment for hyperthyroidism, 10 (16.9%) for hypothyroidism, and 7 (11.9%) had experienced various types of medications in dealing with their thyroid nodule(s) before thyroid surgical resection. Cold nodule (solitary or concurrent with multi-nodularity) in 37 (74%) and hot nodule (solitary or concurrent with multi-nodularity) in 6 (12%) were revealed in a total of 50 patients who had gone through thyroid scan. The sonographic study confirmed that only one cystic lesion of 4 patients, which their thyroid sonography reports were available.

A definitive pathological diagnosis of 56 (94.9%) benign and 3 (5.1%) malignant was obtained after thyroid surgical resection. Thyroid cancer pathology was consisted of 2 papillary carcinomas and one follicular carcinoma. Multinodular goiter was the most prevalent benign pathology with 38 records, whereas follicular adenoma involved 13 cases of all. Twenty-three FNA biopsy reports were malignant for 3 (13.0%), benign for 13 (56.5%), and suspicious for 3 (13.0%) whereas the remaining 4 (17.4%) reports stated inadequacy of biopsy samples. Of the 13 samples initially thought to be malignant due to FNA: 2 were confirmed as malignancy on final pathological examination, besides there was one thyroid malignancy in those with suspicious FNA sample records. All 13

patients with a benign FNA sample were confirmed to have benign lesions while the remaining 2 suspicious and all 4 inadequate FNA biopsy sample patients were proved to have benign tumors.

The sensitivity of FNA was 100% and specificity was 92.8% when we did not include suspicious samples in the final precision analysis. The overall accuracy was 93.7%, PPV 66.7%, and NPV 100%. Positive likelihood ratio was 13.8 and NLR was zero. Considering suspicious FNA samples as malignancy but we computed different outcomes. Sensitivity was still 100% whereas specificity declined to 81.2% as 3 suspiciously reported FNA biopsies were included. Accuracy was 84.2%, PPV 50%, and NPV 100% when PLR decreased to 5.32% and NLR remained as zero. Fine needle aspiration biopsy has several benefits over traditional open incision biopsy for the diagnosis and management of thyroid neoplasm. Few threat of tumor cell contamination of the biopsy tissue, safety and low risk of morbidity and mortality, and simplicity of learning and performance by most clinicians are some of its more apparent advantages. Since FNA became popular in the 1970s, thyroid surgical procedures have decreased by 50% whereas the percent yield of cancers for patients undergoing surgery for thyroid nodules has increased from 10-15% to 20-50%. There are also some comments against the use of FNA such as poor availability of cells or tissues for necessary additional studies and life-threatening risk of being false negative. The economic impact of the introduction of routine preoperative FNA in the management of thyroid malignancy was illustrated by investigators from the Mayo clinic who reported that FNA reduced the number of patients requiring surgery from 67% to 43% and increased the proportion of surgically proven cancers from 14-29%. Fine needle aspiration shows accuracy at diagnosing papillary, medullary, and anaplastic carcinomas of the thyroid but may not be precise enough in the preoperative diagnosis of follicular carcinoma, especially those that are encapsulated and angioinvasive.

Sensitivity and specificity of FNA remain a matter of disagreement; especially when experience and skilled operator and pathologist can play a great role in final outcomes. There are 2 point of views on FNA biopsy precision. Some physicians believe that FNA is mostly specific and almost sensitive due to a number of confirming published data and as a consequence thyroid FNA positive result effectively rules in the diagnosis.<sup>4</sup> Sensitivity ranged from 55-90%, specificity 90-100%, and accuracy was at least 80% in these series. The other attitude indicates that thyroid gland FNA is more sensitive and approximately specific.<sup>2,5</sup> Sensitivity ranged from 80-96.6%, specificity 45-87%, and accuracy was at least 53% these series. Thus, a negative result can effectively rule out the diagnosis of thyroid carcinoma. Our data were in consistent with this

attitude; however, a larger sample and more patients are needed to confirm the results.

We reported a sensitivity of 100%, specificity of 81.2%, and an accuracy of 84.2% in this study. Reviews of the similar literature have shown FNA might be an accurate test. In one of the largest series Ravetto et al retrospectively evaluated 37,895 FNAs performed between 1980-1997. They found FNA to be highly sensitive (91.8%) when the specificity was 75.5%. A pretest probability of thyroid carcinoma of 4% was reduced to 0.4% in the patients with a cytologic diagnosis of benign nodular goiter, whereas it was increased to 90.7% in those patients with a positive cytologic diagnosis.<sup>5</sup> These data suggest that FNA were eligible for deciding on patients to undergo surgery, but the low specificity and accuracy do not allow an adequate plan of the extent of resection. The large number of multinodular goiters could explain the low specificity of FNA when moderate iodine deficiency is prevalent in the region. Higher proportion of follicular neoplasms may reduce the accuracy of FNA. In spite of different precision values and reported accuracy, we are to reveal an important selection bias that is so common in FNA accuracy studies. As we know, many of the present series are based on thyroid resection results and as expected ignore the number of patients who had normal FNA biopsy results and have not face surgical resection at all. These discounted true positive outcomes led to FNA sensitivity be underestimated. Therefore, FNA in thyroid nodules can be the best preoperative test to decide whether to undergo surgery.

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