

# Brief Communication

Research to policy. *Horses for courses*

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The existence of relevant health research, though necessary, is not sufficient. Research alone is no "silver bullet" for health in developing countries. Health research is fragmented; there is little communication between research producers, users and policy makers. Moreover, there is virtually no information on the linkages between health research and health policy in developing countries.<sup>1</sup> Health policies, not infrequently, do not reflect research evidence to the extent in theory they could. It is long debated whether policy process run well ahead from research based evidence or researchers are not selecting the appropriate "Horses for Courses" namely conducting the right research in the right place at the right time. Trostle et al<sup>2</sup> introduced their study by mentioning that researchers are unprepared or unwilling to communicate their results to the public or to decision makers; they accept that publication of results in scientific journals is sufficient to bring them into eventual use. Policy makers, on the other hand, sometimes need unequivocal and rapid research, or want final answers (or covers for their decisions), not predictable conclusions that "more research is needed".<sup>2</sup> Only 10% of research and development spending is currently directed at the health problems that cause 90% of the world's disease burden.<sup>1</sup> Research units and departments in the Arab Ministries of Health should assist with the formulation of assessment tools that reveal the full picture of the way research is used in policy making. Researchers, by conceptualizing the utilization process, could definitely help developing the interest in research- informed policy making and work on strengthening or fostering the research-policy link. The concept of Health Research Systems (HRSs) is now of growing importance. Health Research Systems functions are stewardship, financing, building resources, and conducting studies. One of the main elements that distinguish a HRS is the attempt to develop mechanisms and networks to facilitate the greater use of health research.<sup>1,3</sup>

Research is a structured process of collecting, analyzing, synthesizing, and interpreting (explaining or describing) data to answer theoretical questions not visible in data themselves. Policies are governmental or organizational guidelines about allocation of resources and principles of desired behavior.<sup>2</sup> Health policies are of 3 categories: governance policy which relate to organizational

and financial structures; service policies which cover resource allocation issues and pattern of services, and practice policies which relate to the use of resources by practitioners in delivering patient care. For each category, analysis of the link between policy-making and of research utilization, often identifies at least 3 broad areas of activity: policy agenda setting, policy formulation, and policy implementation.<sup>3</sup> Research legitimizes some policies and throws doubts on others. The study of the role of research in child health policy and programs in Pakistan found some examples of immediate clear-cut linkage between research and decisions. However it shows that research was underutilized.<sup>4</sup> Black<sup>5</sup> mentioned some reasons why research evidence has little influence on service policies: policy makers have goals other than clinical effectiveness, research evidence dismissed as irrelevant, complexity of research evidence or scientific controversy, other types of competing evidence as personal experience, social environment not conducive to policy change, or poor quality of knowledge purveyors.<sup>5</sup> Making the best use of available research studies is a priority goal in most countries-developed or developing. Research communication and dissemination strategies include: maximizing press and media exposure, widespread distribution of brochures and pamphlets, increasing the use of the internet and other electronic means of dissemination, publishing research papers, engaging with policy makers through policy debates, and holding open seminar presentations.<sup>6</sup> However, integration of researchers and policy makers should be at an early stage to overcome the communication gaps. It is assumed that research exposes policy-making to a wider range of validated concepts and experiences than those that can be drawn from the normal time-limited and politically constrained process of policy deliberations. Decisions are not necessarily made based on a single study. On the other hand, a single research study can have multiple policy implications. Best use of the research results starts with ensuring relevance to the potential users. This requires research that fits within national priorities rather than externally imposed agenda. The various groups of people who are concerned by the issues being studied, the stakeholders, should be identified and become involved at various steps of the process of research planning, management and dissemination. Interaction among all the stakeholders need to be intensive and take place at multiple overlapping stages of the research and decision making process. A common pitfall made by researchers in raising recommendations based on study findings is not to involve all stakeholders. Researchers attempt to do this on their own believing that they are more neutral to the situation

and will not bias the recommendations. The role of mediators are perhaps the most crucial component in fostering the linkage of research to policy. They could be researchers themselves, academic groups that support evidence-based decision-making, national research coordinating bodies, or international agencies.<sup>4</sup> Trostle et al<sup>2</sup> looked for factors that promoted or impeded exchanges between researchers and policy makers. These were in turn divided into emphasis on content, actors, process, and context, summarized in **Table 1**. They finally recommended improving communication between researchers and policy makers via training of both parties: assisting researchers to communicate their findings in an understandable and stimulating way, or synthesizing policy makers on the usefulness of research results as an input to decision making. They also recommended that research should be evaluated in terms of their cost

Table 1 - Some factors that promoted or impeded exchanges between researchers and policy makers with emphasis on content, actors, process and context.<sup>2</sup>

Category	Promoting factors	Impediments
Content	Research quality	Vocabulary of researchers and decision makers is different
	Agreement of both researchers and policy makers to give more attentions to biomedical than social	
	Specificity, concreteness and cost- effectiveness	
Actors	Both researchers and policy makers identify priority together	Lack of technical background of policy makers or media
	International support	Policy makers value experience more than information
	Official research organizations namely research department	Agenda brought to bear by non academic interest group
Process	Informal ties	Difficulty in selling research questions and results to policy makers
	Balanced interests	
	Formal communications	
Context	Political stability	Excessive centralization
	Homogeneity of research community	Hierarchal management of information
		Restricted economic resources

and effectiveness before they are considered as the basis for a policy or program. However, this type of evaluation is still underdeveloped internationally.<sup>2</sup>

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A pilot study to investigate over-the-counter drug abuse and misuse in Palestine

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The majority of nonprescription drugs, which are sold over-the-counter (OTC) in community pharmacies are assumed to be used appropriately by patients. However, a small minority of patients can misuse or abuse these products. For example, studies in many countries have shown that a significant number of OTC customers misuse/abuse these drugs.<sup>1,2</sup> The term abuse is used here to describe the use of drugs for non-medical purposes,

while misuse is applied to describe the use of a drug for medical purposes, but in an incorrect manner. Examples of OTC products that could be misused/abused include a wide variety of drugs like amphetamines, ephedrine, caffeine, which are stimulants used primarily to delay the onset of mental and physical fatigue; antitussives and expectorants, which may contain alcohol and some even may contain narcotics such as codeine; dextromethorphan, an opioid with psychoactive effects, present in a variety of cold and cough medications; laxatives used to induce weight loss; anabolic steroids used to increase the muscle mass in conjugation with vigorous training,<sup>3,4</sup> and even sildenafil could be overly used especially by addicts to counteract the sexual depressing effects of opioids. Although the potential for misuse and abuse of OTC medicines is clear, no methods to discover the extent of the problem have been developed. Quantification is complicated by the fact that abusers can visit several different pharmacies in an attempt to obtain supplies and avoid detection. Furthermore, no research has been conducted in Palestine to assess this problem. The aim of the present study was to obtain information directly from the community pharmacists regarding their perception of the extent of OTC drug abuse, the drugs involved, the type of customers whom they suspect of abusing medicines together with suggested methods to deal with this problem.

A questionnaire to be completed anonymously by community pharmacists was developed. The questionnaire was delivered to all community pharmacists in Nablus district, Palestine and were collected back within one week. In the first part of the questionnaire, respondents were asked to fill specific personal information on the pharmacist himself including gender, age, responsibility, the number of years spent in this job field, and location of the pharmacy. In the second part, community pharmacists have been asked if they suspected abuse in their pharmacies and if the clients were strangers or customers. Then they were asked to give a profile of the typical abuser for each product or group of products. Respondents were also requested to indicate the age, gender and approximate number of clients they had suspected for each drug category. Then they were also asked to provide information on any system they had provided in their pharmacies, which limits the access of suspected abusers to identify OTC products and to indicate if they had contacted other pharmacist in their area regarding clients they suspected abusing OTC medicines. The returned questionnaires were coded and were transferred to Statistical Package for Social Sciences for descriptive and statistical analysis.

Table 1 - Distribution of clients according to age group, gender and abused/misused drugs.

Product group and client's characteristics	Relationships
<b>Antitussives</b>	
Age	20-40 years age group is more likely to be suspected than all other age groups.
Gender	Males are more likely to be suspected than females. Only 9.3% respondents mentioned that abuse/misuse is gender insensitive.
<b>Antihistamines</b>	
Age	20-40 years age group is more likely to be suspected than all other age groups.
Gender	Males are more likely to be suspected than females.
<b>Laxatives</b>	
Age	20-40 years age group is more likely to be suspected than all other age groups. 40-60 years age group is more likely to be suspected than under 20 years of age.
Gender	Females are more likely to be suspected than males.
<b>Combination products</b>	
Age	20-40 years age group is more likely to be suspected than all other age groups. <20 and 40-60 years age group are equally suspected.
Gender	Males are more likely to be suspected than females.
<b>Decongestants</b>	
Age	20-40 years age group is more likely to be suspected than all other age groups.
Gender	Males are more likely to be suspected than females.
<b>Simple analgesics</b>	
Age	20-40 years age group is more likely to be suspected than all other age groups.
Gender	Males are more likely to be suspected than females.
<b>Sedatives hypnotics and tranquilizers</b>	
Age	20-40 years age group is more likely to be suspected than all other age groups.
Gender	Males are more likely to be suspected than females.
<b>Alcohol 70%</b>	
Gender	20-40 years age group is more likely to be suspected than all other age groups.
Age	Males are more likely to be suspected than females.

**I. Suspected drug classes and characteristics of abusers/misusers.** Out of 111 questionnaires distributed, 98 questionnaires were returned. One questionnaire of the 98 was returned and excluded as it was filled inappropriately. The respondents were 53.6% females and 44.3% males, while 2.1% of the respondents did not mention their gender. The respondents (41.2%) were between 25-35 years of age. Analysis of the years of experience of respondents shows that the average experience in years was  $10.4 \pm 8.85$  years (range 33 years). The geographic distribution of the responded pharmacies was as follows: 51.5% were in the city center, 41.2% were in the suburbs and 6.2% were in refugee camps. The majority of the respondents (66%) believe that there is an increase in misuse/abuse of OTC products these days that might be attributed to the social, economical and psychological impact of the political instability in Palestine. Responding pharmacists indicated that 78.4% of suspected abusers were foreigners to their pharmacies, while 15.5% of the responding pharmacists indicated that the abusers were among their regular customers. A third group of community pharmacists (6.2%) indicated that it is very difficult to estimate this figure due to the large number of suspected clients. When asked about the drug classes being abused/misused, 80.34% of the respondents mentioned that antitussives were the most commonly abused/misused class. The majority (52.6%) of suspected clients of antitussives were between 20-40 years of age and mostly males, although female abusers were noticed by some respondents. The most antitussive product being abused/misused were those containing the following combination: (codeine phosphate/pseudoephedrine/triprolidine) (53.6%) or (ephedrine/ammonium chloride/codeine phosphate/pheniramine maleate) (5.2%) while 10.3% of the respondents believe that both mentioned combination products are abused. Approximately 30.9% of respondents did not mention any product's name. This suggests that the most commonly abused antitussive products were those containing codeine (opioids). Another class of drug believed by 41.2% of responding pharmacists to be abused/misused was antihistamines with 23.7% of clients being within the age range of 20-40 years and mostly males. Of the antihistamines mentioned were those containing: chlorpheniramine maleate or loratadine or cyproheptadine or dimethindene maleate. When asked on the possible abuse/misuse of laxatives, 67% of respondents mentioned that there is abuse/misuse of laxatives detected in their pharmacies with, 33% of abusers/misusers were within 20-40 years of age and were mostly females. Patients who abuse laxative preparations were either attempting to

control their weight (females) or have a need to defecate regularly. The most widely abused/misused laxative drug was that containing bisacodyl with a percentage of 44.3%, while those containing senna leaves has a percentage of 5.2% and 7.2% have an abuse/misuse in their pharmacies of both of the above products. Combination products (products containing more than one active ingredient such as, analgesics and decongestants or antihistamines in cold and flu preparations) were mentioned by 49.5% of respondents as possible drug of abuse/misuse. Simple analgesics, including nonsteroidal anti-inflammatory drugs, paracetamol and paracetamol containing products were also mentioned by 70.1% as a suspected class of abuse/misuse. Other classes of possible abuse/misuse are mentioned in **Table 1**. Alcohol for external use was mentioned by some respondents as a suspected product of abuse/misuse. Few respondents mentioned that some alcoholics might abuse/misuse mouthwash to get alcohol.

**II. Strategies to limit abuse/misuse.** Pharmacist reported that they had devised a number of systems to limit the access of suspected abuser/misusers to OTC medicines. The most common strategy was to advise the suspected client to refer to his physician. When questioned about their role in dealing with OTC drug abuse/misuse, the majority of respondents (87.6%) indicated that it was appropriate to advise the patients on the correct use, dose and abuse problem, while 86.6% found it's appropriate to alert pharmacy staff on the products commonly abused or misused and suspected clients. A majority (84.5%) found it's appropriate to keep the product out of sight and hence, potential purchasers had to ask for it by name. Other important methods mentioned by respondents include telling the abusers that the product is out of stock, advising the patient to refer to a general practitioner, limiting the quantity sold and refusing to sell. Self-medication, using OTC drugs, is economical and beneficial to patients, healthcare professionals, the pharmaceutical industry and government. However, misuse and abuse of OTC products can arise, which requires close monitoring of specific client population and products. This pilot study requested information from community pharmacists on the current situation in Nablus, Palestine pertaining to the abuse/misuse of OTC products. It is recognized that the use of this method is limited in that results are based on the pharmacists' perception which are subjective. However, it is evident from the data that there is a perception of misuse and abuse of the OTC products. The most commonly identified abused/misused OTC product groups were antitussives, laxatives, simple analgesics, and

sedatives in addition to alcohol. Among the suspected clients, the group with age 20-40 years was more likely to be suspected abusers/misusers than all other age groups. Among the laxatives abusers/misusers, females were more likely to be suspected than males. While among the other OTC products, males were more likely to be suspected than females. Current guidelines in the practice of dealing with such requests recommended that pharmacists used their professional judgment in order to prevent the supply of products which are reliable to abuse/misuse and if necessary the sale of such products should be refused. A variety of methods and policies for dealing with such requests were suggested. Common policies such as: advising the client to refer to his physician, alerting staff to any potential abusers/misusers, advise the patients on the correct use, dose and abuse problem, keeping the product out of sight, or telling the abuser/misusers that the product is out of stock were the most used policies. However, such policies may encourage individuals to go to another pharmacy in the area where they may be able to obtain the products. This problem could be elevated if the pharmacists networked more frequently with one another whereby, a suspected abuser/misusers would be reported to other pharmacies in the locality. In the present survey, pharmacists indicated that approximately 78.4% of the suspicious requests came from strangers, perhaps suggesting that people may be going from pharmacy to pharmacy in order to minimize the detection of their problem, suggesting that indicated strategies to limit abuse/misuse are unlikely to be effective in the longer term. In an international study designed to explore the views of experts within the fields of pharmacy and addiction reach an agreement on best practice in the sale of over-the-counter (OTC) medicines, which are liable to misuse. Key findings include improving access to current information, improved staff training, addressing the issues of non-pharmacy outlets and internet pharmacy sites. Concerns were expressed regarding the possible conflict between commercial and customer interests.<sup>5</sup> Health care professionals should be aware of abuse and misuse as potential problem and research into methods for quantification, identification and treatment should be conducted.

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## Gastric volvulus with identifiable cause in adults. Presentation and management

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**G**astric volvulus, an abnormal rotation of one portion of the stomach around itself, is a rare condition, which is often difficult to diagnose and treat. We report our experience of patients with gastric volvulus and discuss the pathogenesis, presentation and management. In a retrospective analysis of all patients with gastric volvulus seen at Kasturba Medical College Hospital, Manipal, South India, between the period 1986-2000, the files of the patients with the diagnosis of gastric volvulus were identified and reviewed. The specific issues addressed included patients demographic details, etiology, presentation, investigations and treatment, **Table 1.** Eight patients (6 men and 2 women) with gastric volvulus were identified. The mean age was 29 years (range 18-59 years). Volvulus was secondary in 7 patients and primary in one. The underlying causes included Bochdalek diaphragmatic hernia (3 patients), eventration of diaphragm (3 patients) and a large epigastric incisional hernia (following previous perforated duodenal ulcer closure) in one patient. Two of 3 patients with large left diaphragmatic hernia with herniation of stomach, small gut, transverse colon and spleen had in addition underdeveloped lower lobe of the left lung. Five patients had organoaxial volvulus and 3 mesenteric-axial volvulus.

The presentation included recurrent colicky abdominal pain of more than 6 months (range 3 months - 1 year), which was seen in all the 8

patients with 3 of them having severe exacerbation 48 hours before presentation. Four of these also had associated vomiting. Two of the 3 patients with diaphragmatic hernia complained of noisy sounds and pain in the chest. Barium study ordered in 7 patients was suggestive of volvulus in 5 patients and was inconclusive in 2 of them with partial volvulus. The type of volvulus among the positive studies included 3 organoaxial and 2 mesenterico-axial. The upper gastrointestinal endoscopy was suggestive of volvulus in 3 of the 5 patients and the findings included dilated congested proximal stomach filled with gastric fluid, spiral twisting and constriction of stomach with inability to see the pylorus. The chest x-ray in 2 of the 3 patients who presented with diaphragmatic hernia, revealed gastric and small gut shadow with air fluid levels. Computed tomography (CT) scan was carried out in one patient with incisional hernia, which demonstrated the gastric volvulus within the hernial sac. All 8 patients underwent surgical intervention and the details of the surgical procedures are shown in **Table 1**. Two of the 3 patients with diaphragmatic hernia had defects larger than 5 cm and required prolene mesh re-enforcement after reduction of the content and partial closure of the diaphragmatic defect. There were no major complications nor postoperative deaths. The overall median hospital stay was 12 days (ranged 10-16 days). Seven of the 8 patients were followed up to 3 years and one was lost to follow up. None of these 7 patients had recurrence of their symptoms. The mean incidence of gastric volvulus is estimated to be approximately 2.6 new patients per million population per year.<sup>1</sup> Gastric volvulus occurs predominantly in older adults

although it has been described in children and adolescents.<sup>1,2</sup> Primary gastric volvulus is one which occurs spontaneously without any diaphragmatic derangement or other intra-abdominal abnormality and may result due to gastric ligamentous lengthening along with changes in visceral pressure.<sup>1,2</sup> Approximately 30% of gastric volvulus are primary in nature<sup>1,2</sup> and was seen in one of our patient who was found to have lax ligaments and relatively mobile spleen. However, volvulus is more commonly secondary as seen in most of our patients and may be due to causes such as paraesophageal hiatal hernia, congenital or traumatic diaphragmatic hernia, eventration of diaphragm, abdominal bands or adhesions.<sup>1,2</sup> Anatomically, 3 types of gastric volvulus are recognized: organoaxial, mesenterico-axial and mixed.

The signs and symptoms of gastric volvulus depend upon the rapidity of onset, degree of rotation and amount of obstruction. Recurrent abdominal pain, noisy sound and pain in the chest are clinical symptoms seen in chronic volvulus but vomiting with severe pain may indicate an acute exacerbation.<sup>1</sup> The diagnosis of gastric volvulus can be difficult. In this series the most common investigations carried out were barium contrast study and endoscopy. Chest x-ray and CT scan of the abdomen were performed in selected cases. Barium studies provided the greatest yield being diagnostic in 5 out of 7 patients. Endoscopy was diagnostic in 3 out of 5 patients. Plain chest x-ray suggested volvulus of the stomach in 2 patients. Computed tomography scan carried out in one patient with ventral hernia delineated the nonstrangulated volvulus within the sac. Ultrasound

Table 1 - Demographic details, predisposing cause and treatment.

Case	Age	Gender	Predisposing cause	Type	Treatment
1	22	female	Eventration of diaphragm	Mesenterico-axial partial	Reduction of contents. Plication of diaphragm
2	33	male	Bockdalek hernia (left side) > 5 cm	Mesenterico-axial complete	Prolene mesh plasty (thoraco abdominal)
3	18	male	Bockdalek hernia (left side) > 5 cm	Mesenterico-axial complete	Prolene mesh plasty (thoraco abdominal)
4	20	male	Eventration of diaphragm	Organoaxial partial	Plication of diaphragm
5	24	male	Bockdalek hernia (left side) < 5 cm	Organoaxial complete	Primary closure of defect. No mesh, abdominal approach
6	59	female	Left phrenic nerve palsy	Organoaxial complete	Plication of diaphragm
7	21	male	Lax gastric ligaments mobile spleen	Organoaxial partial	Anterior gastropexy
8	48	male	Large epigastric incisional hernia	Organoaxial partial	Prolene mesh hernioplasty

All 8 patients underwent anterior gastropexy at the proximal and distal end of stomach in addition to treatment of primary underlying cause.

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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