Clinical Topics

Clinical examination, xeromammography, and fine-needle aspiration cytology in diagnosis of breast tumours

J MEIRION THOMAS, B M FITZHARRIS, W H REDDING, J E WILLIAMS, P A TROTT, T J POWLES, H T FORD, J-C GAZET

Summary and conclusions

The diagnostic accuracy of clinical examination, xeromammography, and fine-needle aspiration cytology was compared with definitive histological findings in 255 breast lumps excised during one year. When suitable aspirates were obtained for cytological examination the diagnostic accuracy of aspiration cytology was higher than clinical examination or xeromammography. A diagnostic accuracy of 99% was achieved when all three screening tests were in agreement. As well as confirming a clinical diagnosis of malignancy, cytology is useful in identifying malignancy when clinical findings suggest that the tumour is benign. The availability of accurate cytology has affected patient management in many ways.

Xeromammography did not enhance the diagnostic accuracy of clinical examination and aspiration cytology in patients presenting with a breast lump and, as a procedure with potential hazard, the benefit of routine xeromammography is questionable when an efficient cytological service is available.

Introduction

A rapid, inexpensive, efficient, and safe method of distinguishing between benign and malignant breast lumps in outpatient clinics would benefit patients and surgeons greatly, while reducing the waiting list for special investigations. We compared the accuracy of clinical examination, xeromammography, and fine-needle aspiration cytology, evaluated individually and in combination, in diagnosing breast tumours in outpatients. We tried to identify methods of improving the diagnostic usefulness

Combined Breast Clinic, St George's Hospital, Royal Marsden Hospital, and Institute of Cancer Research, London
J MEIRION THOMAS, MRCP, FRCS, senior registrar and lecturer in surgery
B M FITZHARRIS, MB, CHB, lecturer in medicine
W H REDDING, MB, BS, senior house officer
P A TROTT, MB, MRCPATH, consultant cytologist
T J POWLES, PHD, MRCP, senior lecturer in medicine and honorary consultant physician
H T FORD, FRCR, consultant radiotherapist and oncologist
J-C GAZET, MS, FRCS, consultant surgeon and honorary senior lecturer in surgery

St George's Hospital, London
J E WILLIAMS, FRCPED, FRCR, director of radiology

of these screening methods, and to evaluate the role of routine xeromammography in the diagnosis of palpable breast tumours when an efficient cytological service is available.

Methods and results

During 1977, 255 breast lumps in 249 patients were excised for biopsy at this unit. Of these, 77 were proved to be malignant, and 178 were benign. The diagnostic accuracy of clinical examination, xeromammography, and fine-needle aspiration cytology was compared with the definitive histological findings (table I). Because equal

TABLE I—*Accuracy of clinical examination, aspiration cytology, and xeromammography in diagnosing breast lumps when compared with definitive histological findings. Percentages given in parentheses*

	No of breast lumps	Diagnosis	
		Correct	Incorrect
Clinical examination			
Malignant	77	64 (83)	13 (17)
Benign	178	165 (93)	13 (7)
Combined	255	229 (90)	26 (10)
Aspiration cytology			
Malignant	63	59 (94)	4 (6)
Benign	96	92 (96)	4* (4)
Combined	159	151 (95)	8 (5)
Xeromammography			
Malignant	75	61 (81)	14 (19)
Benign	165	141 (86)	24 (14)
Combined	240	202 (84)	38 (16)

*All these specimens were diagnosed suspicious of carcinoma, and not definitely malignant.

numbers of histologically benign and malignant tumours were incorrectly diagnosed by clinical examination (table I) there were also 77 clinically malignant tumours and 178 clinically benign tumours in this series. In tables II and III the tumours are classified according to clinical diagnosis in an attempt to define the place of aspiration cytology and xeromammography in enhancing diagnostic accuracy. The results of aspiration cytology and xeromammography were reported as either benign, suspicious of malignancy, or malignant. In table I tumours reported as suspicious of malignancy have been tabulated as malignant.

When suitable aspirates were obtained for cytological examination, the diagnostic accuracy of aspiration cytology was higher (95%) than either clinical examination (89·8%) or xeromammography (84·2%). Nevertheless, while all breast lumps were assessed clinically and 240 (94·1%) by xeromammography, aspiration cytology was performed in only 196 breast lumps (76·9%) and, of these, 37 (18·9%) were unsuitable for cytological diagnosis. The effective accuracy of aspiration cytology is therefore reduced to 77% when expressed as a percentage of the breast lumps aspirated. Unfortunately, aspiration cytology tended to be omitted when clinical examination was strongly

suggestive of benign breast lump, and in 57 such cases (table II) five tumours (8·8%) were subsequently proved to be malignant on histology.

All three screening methods were performed in 189 of the tumours with diagnostic agreement of all three in 109 cases (57·7%). A diagnostic accuracy of 99% was achieved in these 109 cases because only one breast lump was incorrectly diagnosed (tables II and III). There were no errors in the 49 cases reported as cytologically malignant, but there were four benign tumours (false-positive) among the 14 reported as suspicious of malignancy. In the 96 cases reported as cytologically benign, four were malignant (false-negative) (tables I, II, and III). In the 47 cases reported as radiologically malignant, 43 proved to be malignant while four were benign. In the 38 cases reported as suspicious of malignancy, 18 were malignant, but 20 were benign (total of 24 false-positives). In the 155 cases reported as radiologically benign, 14 were malignant (tables I, II, and III).

Xeromammography would have been a useful adjunct to cytology in patients with carcinoma if it had detected carcinoma in patients with false-negative cytological findings, or in cases in which the aspirate was unsuitable for cytological diagnosis. Nevertheless, in the four patients with carcinoma in whom cytological results were false-negative (tables I, II, and III) the xerogram was reported as benign in every case, though clinical examination suggested malignancy in three and benign breast lump in one. In the eight patients with carcinoma whose cytological specimens were unsuitable for diagnosis (see tables) the xerogram was reported as malignant in seven and suspicious of malignancy in one, but clinical examination had also suggested malignancy in seven of the eight patients. Nevertheless, in four (clinically benign) cases the xerogram alone diagnosed malignancy in three or was suspicious of malignancy in one, but cytology had not been performed in three of these cases and an unsuitable aspirate was obtained in one.

Discussion

At this unit the availability of accurate cytology has affected patient management in many ways. Patients in whom cytological findings are positive undergo exhaustive investigation to detect metastatic disease.[1] They are admitted to hospital as a matter of urgency, and the probable clinical diagnosis and the likely surgical procedure is discussed with the patient. Patients in whom cytological findings are negative are reassured that their breast lump is probably benign, do not undergo full investigation for metastatic disease, and are admitted to hospital at the first convenient opportunity for excision biopsy and frozen section only. In those few patients in whom malignancy is detected on frozen section, full investigation for metastatic disease is performed, and the patients return to theatre on the next operating list for definitive surgery when appropriate. When the aspirate is unsuitable for cytological diagnosis, another specimen is taken and the patient reviewed with special reference to clinical findings and the xeromammography.

The diagnostic inaccuracy of aspiration cytology in this series was 5% (table I), so frozen section remains mandatory before any ablative breast surgery is performed. Nevertheless, in the 49 cases reported as cytologically malignant, rather than suspicious of malignancy, no errors occurred. The incidence of technically unsuitable cytology specimens was 18·9%, and was twice as high in benign tumours compared with malignant tumours. This is probably related to the lower ratio of ductal cells to stromal cells in benign tumours. The incidence of technically unsatisfactory specimens can be reduced from 24·8%

TABLE II—*Analysis of results of xerography and cytology in diagnosing clinically benign tumours (n=178)*

Xerography	No of cases	Cytology					Histology	
		Not done	No cells	Malignant	Suspicious	Benign	Malignant	Benign
Not done	14	7				7	0	7
							1	6
Malignant	10	3	1	2			2	1
							1	0
					1		2	0
							1	0
						3	0	3
Benign	133	42	23	1			1	41
							0	23
							1	0
					4		1	3
						63	1	62
Suspicious	21	5	3	1			1	4
							0	3
							1	0
					0		0	0
						12	0	12
Total	**178**	**57**	**27**	**4**	**5**	**85**	**13**	**165**

TABLE III—*Analysis of results of xerography and cytology in diagnosing clinically malignant tumours (n=77)*

Xerography	No of cases	Cytology					Histology	
		Not done	No cells	Malignant	Suspicious	Benign	Malignant	Benign
Not done	1	1					1	
Malignant	37	0	6	28			0	0
							6	0
					3		28	0
							3	0
						0	0	0
Benign	22	1	3	4			0	1
							0	3
					4		4	0
							3	1
						10	3	7
Suspicious	17	0	1	13			0	0
							1	0
							13	0
					2		2	0
						1	0	1
Total	**77**	**2**	**10**	**45**	**9**	**11**	**64**	**13**

to 6% by an improved sampling technique,[2] in which suction is released before withdrawing the needle. Maintaining suction as the needle is withdrawn results in cells being aspirated into the barrel of the syringe, and thus lost to the cytologist.

The most disturbing finding was the clinician's tendency not to perform aspiration cytology when he was convinced by clinical examination that the tumour was benign. Aspiration cytology may be extremely useful in such cases, for it allows clinically benign breast tumours to be distinguished from the few that are malignant. Aspiration cytology is more accurate than either clinical examination or xeromammography when the aspirate is suitable for cytological diagnosis.[2-6] In this series carcinoma was missed in $8\cdot8\%$ of clinically benign breast tumours when aspiration cytology was omitted. Russ et al[7] reported malignancy diagnosed by aspiration cytology in 13% of clinically benign breast tumours, and in another study[8] 7% of breast tumours were proved to be malignant by cytological examination alone.

Comparative studies of all three diagnostic techniques (clinical examination, xeromammography, and aspiration cytology) in diagnosis of breast tumours have shown that accuracy rates of 99% can be achieved[8 9] with diagnostic agreement of all three methods (40% and 83% of cases respectively). Nevertheless, a combination of three screening tests yielding a high cumulative false-positive rate is of limited value, because many patients would be unnecessarily investigated for the presence of metastases before excision biopsy and frozen section defined the false-positive screening test or tests. We have shown that xeromammography is not a useful adjunct to aspiration cytology because it failed to diagnose any of the four carcinomas reported as false-negative on aspiration cytology, and in the eight cases of malignancy in which the aspirates were technically unsatisfactory, clinical examination was nearly as reliable as xeromammography. We therefore conclude that xeromammography

is not routinely necessary when a breast lump is palpable and when an efficient cytological service is readily available. This view has been expressed already. Rimster et al[10] correctly diagnosed 91% of carcinomas of the breast by clinical examination and aspiration cytology, while the remaining 9% were clinically or cytologically suspicious. Kline and Neal[11] recommended aspiration cytology of all breast lumps and reserved mammography for benign aspirates.

Xeromammography is not without potential hazard and should be reserved for screening high-risk patients when no breast lump is palpable. Routine xeromammography may be useful in detecting a synchronous occult carcinoma in the ipsilateral or contralateral breast, but no such coincidence was seen in this series.

References

[1] Thomas, J M, et al, British Medical Journal, 1978, **2**, 157.
[2] Furnival, C M, et al, Lancet, 1975, **2**, 446.
[3] Stewart, H J, Gravelle, I H, and Apsinon, H T, British Journal of Surgery, 1969, **56**, 341.
[4] Evans, K T, and Gravelle, I H, Mammography, Thermography and Ultrasonography in Breast Disease. London, Butterworth, 1973.
[5] Holaday, W J, American Journal of Clinical Pathology, 1974, **61**, 769.
[6] Coleman, D, et al, Clinical Oncology, 1975, **1**, 27.
[7] Russ, J E, et al, Surgery, Gynecology and Obstetrics, 1978, **146**, 407.
[8] Kreuzer, G, and Boquoi, E, Acta Cytologica, 1976, **20**, 319.
[9] Johnsen, C, Acta Chirurgica Scandinavica, 1975, suppl No 454, p 1.
[10] Rimster, A, et al, Annals of Surgery, 1975, **182**, 1.
[11] Kline, T S, and Neal, H S, Obstetrics and Gynecology, 1975, **46**, 89.

Can constriction of the abdomen by a belt or corset cause angina, hypertension, or tachycardia?

My only knowledge of constriction of the abdomen by a belt or corset causing cardiovascular symptoms is with phaeochromocytoma. There the pressure can cause release of catecholamines with tachycardia, hypertension, and angina. This is obviously rare, however. Sometimes patients feel that gastric distension by gas aggravates their cardiac symptoms, but my own experience covering several decades of taking cardiac histories does not lead me to associate constriction of the abdomen with the production of angina. I have discussed this with several colleagues and their comment is the same.

What precautions should be taken by operators using Cymag powder to kill rabbits?

Gassing powders such as Cymag, which give off hydrogen cyanide when exposed to air and moisture, are extremely poisonous when taken by mouth or inhaled. Everyone using them should follow the manufacturers' instructions to be found in a leaflet inside each Cymag container. Similar instructions and details of legislation are given in a leaflet published by the Health and Safety Executive.[1] Precautions include working in pairs, avoiding wet or windy days, no smoking, standing to windward, and the provision of amyl nitrite capsules. Instructions are also given on storage, transport, disposal, and the maintenance of equipment. Hydrogen cyanide inhalation is not necessarily instantly fatal. Operators should be instructed to recognise symptoms of poisoning (irritation of the throat, dizziness, nausea, weakness, headache, feelings of suffocation, and collapse). First-aid measures include rapid removal from exposure and inhalation of amyl nitrite. If a doctor is available an intravenous antidote can be given. Cobalt EDTA is held by many to be the treatment of choice,[2] but reported unpleasant side effects include vomiting and cardiac arrhythmias,[3] and it probably should be given only if the patient is seriously poisoned (that is, unconscious). The debate continues.

The manufacturers of Cobalt EDTA (Kelocyanor) provide a cyanide emergency kit that should be available where people are regularly using Cymag. It contains amyl nitrite, Kelocyanor, syringes, indwelling intravenous needles, and dextrose injection (the value of which is not known). It can be sent with the patient to hospital if necessary. The pharmacological basis of treatment has been described.[3] Cyanide poisons cellular respiration by combining with the ferric iron of the cytochrome oxidase system. Haemoglobin does not compete with this reaction, but methaemoglobin does by forming cyanmethaemoglobin. The role of amyl nitrite is to convert some haemoglobin to methaemoglobin. Cobalt salts combine with cyanide to form the harmless stable cobalticyanide ion $Co\,(CN)_6^{\equiv}$. Cobalt EDTA is safer and retains the ability to fix the cyanide ion.

[1] Cyanide gassing powders—safe handling, 14 3m 5/78. London, Health and Safety Executive, 1978.
[2] Lancet, 1977, **2**, 1167.
[3] Nagler, J, et al, Journal of Occupational Medicine, 1978, **20**, 414.

What might cause persistent unilateral groin pain in a young woman? The only physical sign is tenderness at the insertion of the inguinal ligament into the pubic tubercle.

Localisation of soft tissues in the groin is difficult because most structures are tender to palpation. Strain of the adductor muscles is seen in horse riders, producing pain on resisted adduction of the thigh and exquisite tenderness over the pubic ramus. Strain of the iliopsoas tendon gives pain on passive and resisted flexion of the hip. Traumatic bursitis of the bursa lying deep to this tendon produces discomfort on forced flexion-in-adduction. These conditions usually settle in time but some appear to respond to friction massage, ultrasonics, or careful steroid infiltration. Strains of the pectineus muscle or the anterior ligament of the hip are really too deep for satisfactory localisation, but tend to resolve spontaneously in the young. Overstretching of the pubic symphysis in late pregnancy causes pain usually radiating to both groins, which resolves with rest.