

Human insulin in general offers no advantage over highly purified animal insulins.³⁰ Patients should therefore be transferred to human insulin only when there is a medical indication, under a doctor's guidance, and after having been informed that a change in symptoms of hypoglycaemia could occur. As advocated previously,³¹ a large randomised clinical trial is now needed to establish definitively whether there is an increased risk of severe hypoglycaemia associated with transfer to human insulin.

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Influence of posture and reference point on central venous pressure measurement

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Measurement of central venous pressure has been used as an indicator of the adequacy of transfusion for more than 20 years.^{1,2} Despite the familiarity of the technique, there seems to have been little emphasis placed on the degree of variation in measurements caused by the patient's posture and the choice of reference point. Early reports emphasised the importance of measuring from the mid-axilla with the patient supine,³ but this is not always practicable, particularly when patients are too breathless to tolerate lying flat. We determined the degree of variation in values for central venous pressure taken from two different reference points and with two different patient positions.

Patients, methods, and results

Twenty five patients who required monitoring of their central venous pressure had a standard 18 cm central venous cannula inserted by one of us (GH) through the right internal jugular vein. The cannula was connected to a bedside saline manometer, and free antegrade flow of saline and retrograde flow of blood was established by raising and lowering the reservoir. In all cases the column of saline fell rapidly on opening the tap to the patient and at the equilibration point the meniscus was observed to move with respiration. A mean value between the swings observed with

respiration was recorded. Patients were asked to breathe as gently as possible while the recordings were being made. Four sets of readings were taken: (a) from the sternal angle with the patient's torso at 45°; (b) from the sternal angle with the patient lying flat; (c) from the mid-axillary line at the level of the fourth intercostal space with the patient lying at 45°; and (d) from the mid-axillary line at the level of the fourth intercostal space with the patient lying flat. In all cases readings

Central venous pressure measurements (cm H₂O) in 25 patients taken from sternal angle or mid-axilla and with patient at 45° or lying flat

Patient No	Age (years)	Central venous pressure (cm H ₂ O)			
		Sternal angle, 45°	Sternal angle, flat	Mid-axilla, 45°	Mid-axilla, flat
1	75	-13.0	-4.0	-1.0	3.5
2	45	-12.0	-3.0	0.0	4.0
3	28	-10.0	-1.5	-1.0	7.0
4	65	-9.0	-3.5	2.5	3.0
5	55	-8.5	-8.0	6.5	4.5
6	74	-8.0	-6.5	5.5	4.5
7	49	-6.5	-4.5	7.0	8.0
8	64	-6.0	-2.0	6.0	11.0
9	60	-5.0	-2.5	11.0	8.0
10	81	-5.0	-1.0	6.0	8.0
11	79	-4.0	0.0	3.0	12.0
12	80	-2.0	0.0	10.5	9.0
13	65	-2.0	3.5	13.5	14.0
14	65	-1.5	13.0	12.0	20.5
15	88	-0.5	4.5	11.5	14.0
16	51	0.0	8.0	14.0	17.0
17	67	0.0	1.0	10.0	10.0
18	76	0.0	0.0	7.0	6.0
19	75	1.0	3.5	17.5	12.5
20	36	1.0	3.0	12.0	14.5
21	50	6.5	14.0	23.0	24.5
22	79	7.5	11.5	20.0	22.5
23	78	8.5	10.0	18.5	21.5
24	74	8.5	8.5	23.5	19.0
25	71	9.5	17.5	24.5	27.0
Mean (SD)		-2.0 (6.5)	2.6 (6.8)	10.5 (7.5)	12.2 (7.1)
Variance		42.4	45.8	56.4	49.8

were taken over less than 15 minutes and less than 30 ml of saline was infused.

The table gives the results. The lowest value measured for each patient occurred when readings were taken from the sternal angle with the patient's torso at 45°. The highest values were from the mid-axillary line with the patient lying flat. The range of individual variation with different postures and reference points was 6-22 cm H₂O. The mean (SD) difference between central venous pressure measured with the patient flat and that measured with the patient's torso at 45° was 4.6 (3.6) cm H₂O when measured from the sternal angle ($p<0.001$) and 1.7 (3.7) cm H₂O from the mid-axillary line ($p<0.03$).

Comment

In surgical recovery areas, accident and emergency departments, and intensive care units central venous pressure is usually measured with the patient supine. After transfer to general wards it is more commonly measured with the patient sitting up in bed. Assuming the same reference point is used, the mean difference in the recorded measurements will be 4.6 cm H₂O from

the sternal angle and 1.7 cm H₂O from the mid-axillary line. However, taking two standard deviations from the mean, there will be some patients in whom the disparity may be as great as 11.8 cm H₂O and 9.1 cm H₂O respectively. This considerable variation results from many factors, including thoracic morphology, compliance of perivascular tissues, and venous tone.³ Unless doctors appreciate that such variation can exist without reflecting any change in the circulating volume, inappropriate management decisions may be made. It is essential that, wherever possible, the same method for measuring central venous pressure is used for each recording taken from a patient and that all readings must be qualified by the anatomical reference point and the patient's posture at the time of recording.

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Pneumothorax: a complication of fine needle aspiration of the breast

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Iatrogenic pneumothorax is a recognised complication of subclavian cannulation, intercostal nerve block, chest aspiration, needle aspiration lung biopsy,¹ and supraclavicular brachial plexus block.² Fine needle aspiration cytology is a standard procedure in diagnosing breast lumps^{3,4} and has few complications.⁴ Indeed, most published papers do not mention complications happening during this procedure, which suggests that clinicians are unaware that serious complications may occasionally occur. The one major report that did present complications identified only minor bruising, which developed in a fifth of 1655 cases.⁴ Pneumothorax occurring after fine needle aspiration of the breast has not to our knowledge been reported; we present seven such cases.

Case reports

The table shows the clinical details of seven cases of iatrogenic pneumothorax after fine needle aspiration of breast lumps for diagnostic purposes. The cases occurred in the breast clinics of three teaching hospitals in Britain, in a clinic at a district general hospital, and in a general practice surgery over a period of 3 years. The two cases from centre A (cases 1 and 2) occurred during a 12 month period in which 449 solid lumps were aspirated for cytology and around 500 cysts were aspirated. No further cases have been reported in a

subsequent 12 month period, giving a rough incidence of 1 in 1000 aspirations.

Comment

Symptomatic iatrogenic pneumothorax occurs rarely after fine needle aspiration of lumps in the breast, but clinicians performing such procedures should be aware of this potentially serious complication. We cannot calculate the exact incidence of this complication as many thousands of aspirations have been performed in the centres as a whole and, from experience of other procedures, asymptomatic pneumothoraces probably also occur. In most of our series the aspirations were performed at the periphery of the breast or in the axilla. Here the breast depth is minimal and proper fine needle aspiration technique, in which multiple passes are performed at different angles transfixing the breast lump, increases the risk of inadvertently breaching the pleura. Also, most breast lumps occur in the outer half of the breast and so more aspirations are performed there. In aspirating lumps at the periphery of the breast clinicians should try to pass the needle parallel to the chest wall rather than at right angles to it, as is conventional teaching.

Because this complication is rare, routine chest radiography after aspiration is not indicated. Patients should, however, be asked about new symptoms before being allowed home. In our study the patients presented late because they assumed that pain was a normal part of the aspiration procedure and they did not report the immediate pain from the pleural breach to the doctor in the clinic. Clinicians performing aspirations should therefore perhaps explain to their patients that chest pain persisting after the needle has been withdrawn is abnormal.

Patients who develop dyspnoea or any immediate

Clinical details of seven cases of iatrogenic pneumothorax after fine needle aspiration of the breast

Case No	Setting	Age (years)	Final diagnosis	Site of lesion	Grade of aspirator	Onset of symptoms of pneumothorax	Time to presentation (hours)	Pneumothorax managed by	Method of management
1	Teaching hospital A, breast clinic	43	Cyst	Upper outer quadrant	Registrar	Immediate	4	General physician	Chest drainage
2	Teaching hospital A, breast clinic	50	Benign nodularity	Upper outer quadrant	Senior house officer	Immediate	48	Chest physician	Observation
3	General practice	33	Fibroadenoma	Axillary tail	Principal general practitioner	Immediate	72	Chest physician	Aspiration
4	Teaching hospital B, breast clinic	45	Lymph node	Axilla	Registrar	Immediate	Immediately	Surgeon	Observation
5	Teaching hospital C, breast clinic	42	Benign lump	Upper outer quadrant	Registrar	6 hours	24	General physician	Chest drainage
6	Teaching hospital C, breast clinic	37	Benign lump	Upper outer quadrant	Registrar	6 hours	48	General physician	Chest drainage
7	District general hospital	37	Benign nodularity	Deep	Consultant	Immediate	48	General physician	Chest drainage