

52.0% of women in the medium and high severity categories, respectively.

Comments

Legalisation of abortion in South Africa immediately decreased morbidity but the magnitude was not substantial, possibly because morbidity was already lower than in many countries. The lack of change may reflect additional covert induced abortion activity, perhaps through the use of misoprostol in unregistered settings. There has been a trend towards lower technology. While more manual vacuum aspiration and less general anaesthetic and blood transfusion is commendable, antibiotic use and pain relief seem inadequate. The trend towards lower technology partially reflects success of training programmes for induced abortion; however, our findings suggest that further structured training in the use of manual vacuum aspiration with paracervical

block and appropriate use of antibiotics and misoprostol would be beneficial.

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Competing interests: None declared.

- 1 Reproductive Rights Alliance. National statistics on termination of pregnancy. *Barometer* 1999;3:4-6.
- 2 Rees H, Katzenellenbogen J, Shabodien R, Jewkes R, Fawcus S, McIntyre J, et al. The epidemiology of incomplete abortion in South Africa. *S Afr Med J* 1997;87:432-7.
- 3 Brown H, Dickson-Tetteh K, Jewkes R, Levin J, Rees H, Gumede T. Epidemiology of incomplete abortion: South Africa 2000. Johannesburg: Reproductive Health Research Unit, 2002. (Technical report.)
- 4 Jewkes R, Fawcus S, Rees H, Lombard C. The South African incomplete abortion study: methodological issues. *Stud Fam Plann* 1997;28:228-34.
- 5 Rao JNK, Scott AJ. On chi-squared tests for multiway contingency tables with cell proportions estimated from survey data. *Ann Stat* 1984;12: 46-60.

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Drug points

Metabolic decompensation in pump users due to lispro insulin precipitation

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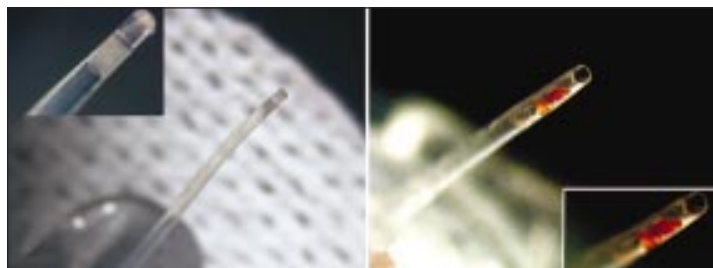
Small, short term studies show that lispro insulin (Humalog; Eli Lilly & Co, Indianapolis, IN), commonly used in pump therapy, is stable in insulin pumps.¹ However, in agreement with reports by others,² we have noted several patients who have developed erratic and unpredictable glucose fluctuations with lispro insulin that have resolved when the treatment was changed to buffered regular insulin (Velosulin; Novo Nordisk, Princeton, NJ) and aspart insulin (Novolog; Novo Nordisk, Princeton, NJ). We have confirmed insulin precipitation in the infusion catheters used by two patients.

Case 1

A 42 year old woman who had type 1 diabetes mellitus for 31 years had excellent glycaemic control (haemoglobin A_{1c} 6.1%) using buffered regular insulin in her Minimed 507C pump (Medtronic Minimed, Northridge, CA). Forty hours after changing to lispro insulin she awoke from sleep with nausea; her fingerstick blood glucose concentration was 21.4 mmol/l and ketone bodies were present in her urine. Troubleshooting revealed that her Silouette infusion catheter was blocked (figure). Radioimmunoassay confirmed that the precipitate occluding the catheter was insulin. Her treatment was changed back to buffered regular insulin and no recurrences of catheter occlusion occurred. She subsequently changed to aspart insulin and, to date, after five months has had no catheter blockages.

Case 2

A 31 year old woman who had type 1 diabetes mellitus for 12 years (haemoglobin A_{1c} 6.5%) was using a Disetronic



Lispro insulin precipitate in infusion catheters for Case 1 (left) and Case 2 (right). Case 2 shows insulin precipitate stained with dithizone (diphenylthiocarbozone)

H-Tron V-100 pump (Disetronic Medical Systems, Minneapolis, MN). After her treatment was changed from buffered regular insulin to lispro insulin, her glucose concentration sometimes fluctuated unexpectedly. These episodes resolved when the infusion catheter was removed. The outer wall of the Sof-Set catheter that had been removed after one of these episodes showed a white precipitate, and staining with dithizone (diphenylthiocarbozone) confirmed that the precipitate was insulin (figure).

Patients who use lispro insulin in their pumps and who have unpredictable glucose fluctuations should be advised to consider changing to buffered regular insulin or aspart insulin. The two cases described above indicate that instability of lispro insulin is not specific to a particular infusion catheter or type of pump.

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- 1 Loughheed WD, Zinman B, Strack TR, Janis LJ, Weymouth AB, Bernstein EA, Korbas AM, Frank BH. Stability of insulin lispro in insulin infusion systems. *Diabetes Care* 1997;20:1061-5.
- 2 Wright AWD, Little AJ. Cannula occlusion of insulin lispro and insulin infusion system. *Diabetes Care* 1998;21:874.