

particularly to players who have had concussion; they should not return to the game until at least 3 weeks after the injury. All schools are compelled to keep an injury register. If the register included information of the type previously collected,¹ it would allow identification of current and changing injury trends and might be analysed on a national basis to identify trends in high-school rugby injuries for the entire country.

Responsibility for these changes. Schoolboy rugby is controlled and organized by the regional Schoolboy Rugby Unions. The authors believe that the responsibility for introducing these changes lies ultimately with those unions. The privilege of organizing schoolboy rugby carries the responsibility for ensuring optimal care for all injured players.

This study forms part of a project on high-school rugby injuries undertaken in collaboration with the Cape Department of Education.

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The role of hexoprenaline in suprapubic amniocentesis during late pregnancy

A pilot study

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Summary

Suprapubic amniocentesis is often complicated by the fetal head being fixed in the pelvis, oligohydramnios or a hyperirritable myometrium. These factors limit the success rate associated with the procedure. If the myometrium is relaxed with a β_2 -stimulant, a higher success rate may be achieved. This was investigated in a randomized, prospective, double-blind pilot study using hexoprenaline.

When four- or five-fifths of the fetal head was palpable above the pelvis, hexoprenaline (17 amniocenteses) showed no advantage over a placebo (16 amniocenteses). However, when three-fifths or less of the fetal head was palpable above the brim, 4 dry taps were obtained in the control group using a placebo (17 amniocenteses), while none occurred in the study

group (19 amniocenteses) ($P < 0,05$). Elevation of the fetal head was less difficult in the study group, but this difference was not statistically significant.

These results suggest that hexoprenaline is not indicated for routine use during amniocentesis. When a dry tap is obtained or when marked difficulty is encountered in lifting the fetal head from the pelvis, 10 μ g hexoprenaline administered intravenously 5 minutes before amniocentesis appears to facilitate successful completion of the procedure. However, a larger series is necessary to confirm this observation.

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Suprapubic amniocentesis during the last month of pregnancy is often complicated by the fetal head being fixed in the pelvis, oligohydramnios or a hyperirritable myometrium. These factors limit the success rate associated with the procedure and make it more difficult for both patient and physician. An alternative is to perform a high puncture under ultrasonographic control, but not all institutions possess appropriate facilities. Under these circumstances suprapubic amniocentesis may be successful more often if the myometrium is relaxed by a β -stimulant to reduce the force from above. In this way the fetal head may easily be lifted from the pelvis, allowing the accumulation of amniotic fluid beneath it.

This pilot study was designed to evaluate whether hexoprenaline, a β_2 -stimulant, could make suprapubic amniocentesis easier to perform during the last month of pregnancy.

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Patients and methods

Patients due for amniocentesis during the last month of pregnancy were selected for study on the basis of the following criteria: (i) single pregnancy with a vertex presentation and gestational age 37 weeks or more; (ii) no contraindications to suprapubic amniocentesis, e.g. placenta praevia; and (iii) no medical condition that would contraindicate the use of a β_2 -stimulant (e.g. heart disease, diabetes mellitus). Placental localization was not necessarily a prerequisite. If the fetus was not markedly growth-retarded and the fetal skull was fixed in the pelvis in the absence of a history of antepartum haemorrhage, a suprapubic amniocentesis was considered safe without previous placental localization, but if the above was not the case then the patient was submitted to placental localization first.

After the patients had been selected for the study the procedure was explained to them and written consent was obtained. Thereafter patients were directed by one of the authors (T.F.K.) into either the study group or the control group, using a table of random numbers generated by a computer. The study group was to receive hexoprenaline 10 μ g (4 ml) intravenously 5 minutes before amniocentesis and the control group was to receive 4 ml sterile water by the same route. The other authors and the patients were at all times unaware whether hexoprenaline or water had been used.

All amniocenteses were performed by H.S.C. Firstly the amount by which the fetal head was palpable above the pelvic brim was evaluated (in fifths) by H.S.C. and recorded by T.F.K. While H.S.C. was preparing for the amniocentesis (performed according to standard aseptic techniques using sterile gowns and gloves), T.F.K. recorded the patient's pulse rate and blood pressure and injected the hexoprenaline or the placebo intravenously while noting the time. Five minutes later the amniocentesis was performed suprapubically. No local anaesthetics were used. If the fetal head could not be lifted from the pelvis from above, a second sterile glove was used to elevate the head vaginally, after which the glove was removed by an assistant in order that the amniocentesis could be performed aseptically using the original glove. During the whole procedure T.F.K. recorded the patient's pulse rate and blood pressure every 2½ minutes without revealing the results to H.S.C.

The following details were recorded after each procedure: whether it was successful, whether a dry or bloody tap was obtained and the level of difficulty of performance of the

procedure. Difficulty was classified as follows: grade 1 — fetal head easily lifted by abdominal manipulation only; grade 2 — fetal head lifted by abdominal manipulation only, but with marked difficulty; grade 3 — fetal head easily lifted out of the pelvis utilizing both vaginal and abdominal manipulation; grade 4 — fetal head lifted out of the pelvis utilizing both vaginal and abdominal manipulation, but with marked difficulty; and grade 5 — impossible to lift the head by any means.

After amniocentesis the fetal heart was auscultated and the patient was asked for her opinion of the procedure. If a bloody tap was obtained an Apt test was carried out to determine whether the blood was maternal or fetal in origin.

The patients were divided into two groups for analysis: group A — patients in whom the fetal head was high, four- or five-fifths being palpable above the brim; and group B — patients in whom the fetal head was low, three-fifths or less being palpable above the brim. The median test was used to compare the results obtained in the hexoprenaline group with those in the placebo group. Since the number of observations per group was small, Fischer's exact probability was used here to evaluate the significance of the 2 x 2 contingency tables. The mean values were used to compare the maternal pulse rates and blood pressures and the Student's *t* test to compare these mean values.

Results

Hexoprenaline was given to 17 patients in group A (high fetal head) and 16 patients in the same group received water as a placebo. In group B (low fetal head) 19 patients received hexoprenaline and 17 received water. In group A no significant differences were observed between the study and control patients (Table I), except for a lowering in maternal diastolic blood pressure and a rise in maternal pulse rate in the study group (Table II). In group B, however, the most striking difference observed was in the number of dry taps obtained — none in the group that received hexoprenaline and 4 in the group that received water ($P < 0,05$). There was also a difference as regarded grading of difficulty in performing the procedure in group B (2,64 in the hexoprenaline group and 3,35 in the placebo group), but this difference was not statistically significant. As regards maternal diastolic blood pressure and pulse rate in group B, similar trends to those in group A occurred. Three patients in group B had bloody taps (1 who received hexoprenaline and 2

TABLE I. DATA ON PATIENTS AND RESULTS OF AMNIOCENTESIS*

	Hexoprenaline	Water	Significance
Group A (high fetal head)			
No. of patients	17	16	
Age (yrs)	26,0 ± 7,5	27,0 ± 4,75	NS
Gravidity	2,0 ± 1,5	2,0 ± 1,5	NS
Duration of pregnancy (wks)	37,5 ± 1,5	38,0 ± 1,0	NS
Dry taps (no fluid)	2	1	NS
Blood in amniotic fluid	0	0	NS
Grade of difficulty	1,41 ± 1,5	1,31 ± 0,5	NS
Group B (low fetal head)			
No. of patients	19	17	
Age (yrs)	26,0 ± 4,0	23,0 ± 3,0	NS
Gravidity	3,0 ± 0,5	2,0 ± 1,0	NS
Duration of pregnancy (wks)	38,0 ± 1,0	38,0 ± 1,0	NS
Dry taps (no fluid)	0	4	$P = 0,04$
Blood in amniotic fluid	1	2	NS
Grade of difficulty	2,64 ± 0,25	3,35 ± 0,5	NS

*Showing the median and the quartile deviation for the ordered variables.
NS = not statistically significant.

TABLE II. MATERNAL PULSE RATES AND BLOOD PRESSURES

	Hexoprenaline	Water	P value
Group A (high fetal head)			
Pulse rate before	87,05 ± 13,51	92,24 ± 20,26	0,380
Pulse rate after 5 min	112,76 ± 17,79	95,59 ± 17,42	0,004
Systolic BP before	119,21 ± 15,12	129,41 ± 21,86	0,119
Systolic BP after 5 min	121,05 ± 15,51	129,41 ± 22,21	0,206
Diastolic BP before	76,32 ± 14,89	87,06 ± 16,49	0,049
Diastolic BP after 5 min	71,58 ± 11,55	85,88 ± 15,93	0,005
Group B (low fetal head)			
Pulse rate before	90,82 ± 16,05	88,12 ± 10,13	0,566
Pulse rate after 5 min	112,76 ± 13,81	90,56 ± 12,93	0,000
Systolic BP before	121,47 ± 19,98	118,12 ± 20,73	0,641
Systolic BP after 5 min	127,06 ± 17,24	113,12 ± 10,94	0,010
Diastolic BP before	78,24 ± 12,74	76,56 ± 16,80	0,75
Diastolic BP after 5 min	74,41 ± 14,02	75,31 ± 9,39	0,829

BP = blood pressure in mmHg.
Pulse rate measured in beats per minute.

who received placebo), and in all the blood was proved to have been maternal in origin. Only 1 patient developed a supine hypotension syndrome.

Discussion

The results of this pilot study indicate that hexoprenaline might be of value in patients in whom marked difficulty is experienced in lifting the fetal head from the pelvis, or from whom a dry tap is obtained. It appears that it is not necessary to use hexoprenaline routinely for suprapubic amniocentesis. However, this conclusion should be confirmed in a larger study.

Although a fairly high dose of hexoprenaline was used in this study, few untoward effects occurred. The majority of the patients developed tachycardia, but all of them tolerated it and it seldom lasted more than 20 minutes. The effect of hexoprenaline on the heart is less significant than that of fenoterol, ritodrine and salbutamol.¹ Only 1 patient developed a supine hypotension syndrome and in no case was fetal bradycardia detected. However, care must be taken in patients with diabetes mellitus, since β -stimulants can cause hypokalaemia, hyperinsulinaemia and hyperglycaemia.² Furthermore, these drugs can induce an increase in hypoglycaemia in preterm infants, especially those delivered within 48 hours of maternal treatment.^{3,4} In patients with heart disease the tachycardia caused by β -stimulants may induce lung oedema.

Amniocentesis performed under ultrasonographic control is undoubtedly the least complicated method. When ultrasound is not available other methods should be adopted. Suprapubic amniocentesis is a safe alternative when the fetal head is fixed into the pelvis. The elevation of a low, fixed fetal head can be facilitated by the Trendelenburg position with or without pushing the head up vaginally. Although the Trendelenburg position was not used in this study, it can be used as well as a β_2 -stimulant. Nevertheless, a β_2 -stimulant alone will facilitate the elevation of a low fetal head with simultaneous pooling of amniotic fluid in the lower segment. When the fetal head is high, it is easily elevated without these additional measures.

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