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Chorionic villus sampling (CVS). Randomized study of efficacy of two transcervical biopsy methods: aspiration canulas and small forceps

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Summary

A randomized study of two transcervical biopsy methods was performed. One method involved the use of an aspiration catheter and the other a tissue biopsy forceps. 120 chorionic villus samplings were performed in 30 patients. The percentage of success in taking biopsies and the resulting number of karyotypes were identical in both groups. The amount of removed trophoblastic tissue was greater when the forceps was employed. When the aspiration catheter was used, a sufficient amount of trophoblastic tissue was obtained for karyotyping purposes.

It was easier to insert the aspiration catheter than the forceps. The echogenicity of the catheter and forceps were identical.

The aspiration catheter has two advantages. Firstly, it is malleable and fits to the anatomy of the cervical canal and the site from which the biopsy is to be taken. Secondly, it is disposable.

Chorionic villi biopsy; Aspiration catheter; Tissue biopsy forceps; Villiferous chorion; Trophoblast; Karyotype; Antenatal diagnosis

Introduction

A chorionic villi biopsy serves as an early and rapid antenatal diagnosis. The biopsy of the trophoblast consists of taking at 10 weeks of amenorrhea, with an

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aspiration catheter or a biopsy forceps, a fragment of the chorionic villi, which contains the genetic potential of the fetus. Most punctures are presently carried out with echographic monitoring according to the method of Ward [19], either with a biopsy forceps [14] or an aspiration catheter [11]. At the present time there are no arguments to establish the superiority of one of the methods over the other.

We compared the efficacy of one type of catheter, the CVS catheter, to that of the biopsy forceps, while studying echogenicity, ease of insertion, the quantity of trophoblastic tissue obtained, and the subsequent karyotype for each of the methods.

Materials and methods

Patients

The study was carried out in the Department of Obstetrics and Gynaecology of the Antoine Beclere Hospital, Clamart, France, between 1 May and 31 December 1987.

Thirty patients between 18 and 45 years of age (average 27.8 ± 8.0 years) were included in the study.

These women had pregnancies of between 7 and 12 weeks gestational age (average 10.2 ± 1.7 weeks). The gestational age was determined by echography. The group under review consisted of pregnant women who had agreed to participate in the study and who were awaiting legal abortions. In each case, the patients were informed and their consent was obtained. At that time, they received information concerning the legal provisions with regard to legal abortions and the biopsy which was to take place at the same time.

Excluded from the study were patients with a gestational age of less than 7 weeks or more than 12 weeks, or with an arrested pregnancy.

Biopsy instrumentation

Two types of biopsy instruments were employed. The CVS catheter* is 31 cm long, has an external diameter of 1.5 mm and a distal opening. This instrument is a malleable tube coated over its distal part with specially treated steel to make it echogenic. It has a plastic sheath and a Luer's coupling device and is used with an obturating mandril to prevent the entry of mucus during insertion (Table I).

TABLE I

Characteristics of biopsy instruments

Instrument	Length (mm)	External diameter	Characteristic
Biopsy forceps	300	1.5	rigid
CVS catheter	310	1.5	malleable

* Cathéter CVS Laboratoire CCD, 44 rue Notre Dame de Lorette, 75009 Paris.

The second instrument (Table I) is a Storz tissue biopsy forceps ** 1.5 mm in diameter and 30 cm long.

Biopsy method

Biopsies were taken under echographic control [19]. The site of the biopsy was the chorion frondosum.

When using the catheter, a sterile Colin speculum was first inserted for visualization of the cervix. With echography, the angle formed by the cervical canal and the position of the biopsy site was determined. The catheter was then shaped to fit that angle. The catheter was inserted through the cervical canal with real-time continuous ultrasonic monitoring. The distal end of the catheter was progressively directed up to the site of the biopsy. The obturating mandril was withdrawn. A 20 cc syringe was attached and 10 cc were aspirated while slowly withdrawing the catheter up to the internal os of the cervix.

The biopsy specimen was immediately put into a suitable medium for subsequent cytogenetic analysis. Four biopsy specimens were taken from each patient.

When using the biopsy forceps, the closed distal end was directed with echographic monitoring and opened when the site of biopsy was reached.

With echography, it was possible to monitor the seizing of a fragment of villous chorion. The forceps was closed to detach a few villiferous projections which were transferred into a plastic tube containing RPMI medium.

In each patient, two biopsies were taken with the aspiration catheter and two with the biopsy forceps. The use of either method was randomly established.

In 15 patients, the first biopsy was taken with the aspiration catheter. In the other 15 patients, the first biopsy was taken with the forceps. Consequently, each patient served as her own control for the analysis of echogenicity and the ease of insertion of the biopsy instrument.

There were 120 insertions in the 30 patients. After each insertion, an echographic study was performed. The viability of the pregnancy and the condition of the biopsy site were noted.

Cytogenetic analysis

The weight of the chorionic villi obtained for each specimen was evaluated by the physician taking the biopsy and by the cytogeneticist present during the biopsy procedure, comparing them with specimens of known weight.

The weights of the biopsy specimens were noted: less than 5 mg, 5 mg, 10 mg and more than 10 mg.

The specimens of chorionic villi were sent to the cytogenetic laboratory (Ambroise Pare Hospital) where karyotypes were performed using the direct method described by Simoni [16].

Recording of results

The following data were recorded: patient age, number of pregnancies, parity, gestational age and location of the villiferous chorion.

** Pince à biopsie (Biopsy Forceps), Storz (1.5 mm), 14 rue de Lancry, 75010 Paris.

The difficulty of insertion of the biopsy instrument through the cervical canal was noted: insertion was considered as difficult when it was necessary to apply traction on the cervix with a Pozzi forceps. Insertion was considered as easy when the instrument passed smoothly without any prior dilatation of the cervix.

When evaluating difficulty of insertion, only the first insertion was taken into account for each of the instruments.

The echogenicity of the instrument, which means correct visualization by the operator by echographic monitoring during the biopsy procedure, was evaluated by the echographer. After each insertion, any incidents or accidents were noted: hematoma, transient bradycardia, cardiac arrest, rupture of the fetal membranes, or metrorrhagia.

The results were analyzed statistically with the chi-square distribution test.

Results

Table II shows the age, number of pregnancies, the parity of the patients and the gestational age as established by echography (measurement of cranio-caudal length).

The rates of success of obtaining chorionic villi with the forceps and the catheter were, respectively, 87 and 83% with the first insertion, and 93 vs 90% for the second insertion.

These differences are not significant. The rate of success in taking biopsies of chorionic villi with the biopsy forceps and aspiration catheter is identical (Table III).

Table IV shows the rate of success in taking biopsy specimens of chorionic villi in terms of the biopsy site, that is either anterior or posterior. There is no significant difference in the rate of success in terms of this biopsy site.

TABLE II

Age of patients, parity and number of pregnancies

	Mean	SD
Age of patients	27.8	8.0
Number of pregnancies	2.2	1.2
Parity	0.8	0.9
Term	10.2	1.7

TABLE III

Success of chorionic villi biopsy procedure for karyotyping

Instrument	1st insertion		2nd insertion		Total	
	(n = 30)	(%)	(n = 30)	(%)	(n = 60)	(%)
Biopsy forceps	26	87	28	93	54	90
CVS catheter	25	83	27	90	52	86

TABLE IV

Chorionic villi biopsies and biopsy site (success of biopsy method)

Instrument	Anterior		Posterior	
	(n = 13)	(%)	(n = 17)	(%)
Forceps	12	92	16	94
Catheter	12	92	15	88

In the same way, there is no difference in the success of taking a biopsy specimen in nulliparous or parous patients (Table V).

On the whole, the chorionic villi were obtained in 90% of cases with the biopsy forceps and in 86.6% of cases with the aspiration catheter. There is no significant difference between these two results. One difference does exist in the amount of tissue obtained per insertion in terms of the two methods (Table VI). The biopsy forceps always obtained specimens greater than or equal to 10 mg, whereas with the aspiration catheter, no biopsy specimen greater than 5 mg was ever obtained. Biopsy specimens of chorionic villi weighing 5 mg were obtained in 48% of cases with the CVS aspiration catheter versus 10% of cases with the biopsy forceps. Specimens of villi weighing 10 mg were obtained in 45% of cases with the forceps versus 33% of cases with the catheter. Finally, with the forceps, biopsy specimens weighing more than 10 mg were obtained in 35% of cases. In all cases, these differences are significant. The amounts of trophoblast obtained with the catheter are significantly smaller than those obtained with the forceps. Nevertheless, the aspiration catheter does obtain tissue biopsies of sufficient quantity for karyotyping.

The ease of insertion of the biopsy instrument assumes a smooth passage without difficulty, and guidance to the biopsy site without use of prior dilatation of the cervix or traction on the cervix with a Pozzi forceps. In each case, only the first insertion of each instrument is taken into account (Table VII). Insertion was easy in 63% of cases with the aspiration catheter, whereas it was easy in only 36% of cases with the biopsy forceps. This difference is significant.

Data concerning the echographic visualization of the biopsy instrument is compiled in Table VIII. In both methods, echogenicity is satisfactory in 96% of cases. In fact, visualization of the forceps or catheter was impossible in only one patient who was greatly overweight. In all other cases, the echogenicity of the catheter and forceps was both satisfactory and comparable.

TABLE V

Parity and success of chorionic villi biopsies

Instrument	Nullipara		Primi- or multipara	
	(n = 15)	(%)	(n = 15)	(%)
Forceps	28	93	26	86
Catheter	28	93	25	83

TABLE VI

Amount of trophoblastic tissue removed

Instrument	Chorionic villi obtained		Amount obtained per insertion							
	(n = 60)	(%)	< 5 mg	(%)	5 mg	(%)	10 mg	(%)	> 10 mg	(%)
Forceps	54	90	0	0	6	10	27	45	21	35
Catheter	52	86.6	3	5	29	48	20	33	0	0

TABLE VII

Ease of instrument insertion. Ease of insertion assumes the absence of traction on the cervix (no pozzi forceps) and a smooth passage of the instrument without prior dilatation.

Instrument	Easy insertion		Number of insertions
	(n)	(%)	
Forceps	11	36	30
Catheter	19	63	30

TABLE VIII

Echographic visualization of biopsy instrument

Instrument	Visualization		Total number of insertions
	n	(%)	
Forceps	58	96	60
Catheter	58	96	60

Complications occurring during the tissue biopsy procedure were rare. In no case bradycardia, cardiac arrest or rupture of the fetal membranes were noted. Metrorrhagia of little abundance was seen in three cases with the forceps and in one case with the catheter. A hematoma of approximately 1 cm in diameter appeared on two occasions following use of the catheter (Table IX). This table takes into consideration only the first insertion of the first instrument.

TABLE IX

Intraoperative complications

Complication	Forceps (n = 15)	Catheter (n = 15)
Metrorrhagia	3	1
Hematoma	0	2
Bradycardia	0	0
Cardiac arrest	0	0
Rupture of membranes	0	0

Complications increase with the number of insertions. Nevertheless, after four insertions, no serious complication was seen in any of the patients.

Discussion

The rate of success in taking biopsy specimens of chorionic villi for karyotyping is identical whatever the method employed (forceps or catheter), and this rate approaches 90%. Other studies using different brands of catheters did not show any decrease in failure rate of chorionic tissue biopsy sampling [5,7,13]. A karyotype could be obtained in 27 patients, with three failures. In one patient, it was impossible to take a tissue specimen and in two patients, there was a bacterial contamination of the biopsy specimen.

The echogenicity of the catheter is as good as that of the forceps. For a great many authors, the rate of success is greater than 90% [3,17]. However, these authors did not give the rate of success per insertion, but rather an overall success rate, and the number of insertions can, in some cases, attain a figure of six [17]. This 90% success rate is experienced by MacKenzie [11].

Some authors stress the difficulty of taking a biopsy specimen in the case of an anterior placenta [11] and prefer in some cases to use the transabdominal route [15]. In our study, we did not encounter any significant differences, whatever the site of the chorionic villi. The amount of tissue obtained is greater when the biopsy forceps is used. Nevertheless, on biopsy, the amount of trophoblastic tissue obtained with the catheter is sufficient for karyotyping. The fact of taking a smaller amount of trophoblastic tissue is probably beneficial for the further course of the pregnancy. However, it is worth noting that the catheter aspirates a blood-stained specimen, in contrast to that obtained with the forceps.

A recent study of miscarriages in relation to biopsy taking of chorionic villi revealed a rate of spontaneous abortion of 8% in France [4], while this figure is between 3 and 5% with other teams [2,6,8–10]. The tissue biopsy forceps is the instrument most frequently used in France, whereas, in other countries, chorionic villi specimens are taken by aspiration. This study does not permit an analysis of this particular point regarding miscarriages subsequent to trophoblastic biopsies. Nevertheless, it is indeed possible that the smaller amount of removed tissue could have a cause and effect relationship on the smaller number of miscarriages.

The catheter does have two advantages. Firstly, it is malleable and fits to the anatomy of the cervical canal and the selected tissue biopsy site. Secondly, it is disposable. This latter consideration probably diminishes the risk of infection and simplifies the method, in as much as sterilization is not necessary.

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