CARDIOTOCOGRAPHIC MODIFICATIONS DURING CONTINUOUS EPIDURAL ANAESTHESIA IN LABOUR

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SUMMARY

Cardiotocographic variations certainly attributable to epidural anaesthesia were studied over the period 1972-1980 on 716 patients in labour. Transitory side-effects due to both direct and indirect action of local anaesthetics appeared in 1.4% of the cases, without, however, subsequently creating any particular foeto-newborn problem.

On the basis of the experience acquired, it seems justifiable to affirm that the correct use of continuous epidural block, effected by very small doses of bupivacaine (10-20 mg per administration) is almost risk-free. The only inconvenience therefore that may sometimes arise would only be due to the revelation of a concealed cava occlusion when the maintenance of a left lateral position is not observed.

Epidural anaesthesia is considered today the most effective method of relieving labour pain. Applied strictly according to simple fundamental technical principles on the basis of the physiopathological knowledge in the obstetric and anaesthesiological field, this method may now also be considered very safe for both mother and foetus ([4, 6]). However, sharp criticism still prevails regarding possible foetal repercussions directly or indirectly due to local anaesthetics ([7]). The aim of the present study is to report the incidence, type and entity of cardiotocographic modifications observed during nearly ten years experience of this type of anaesthesia.

MATERIAL AND METHODS

In order to effectuate continuous epidural block, recourse has been made, in the majority of cases, to the adoption of a single use pack of a Tuohy needle, 16 or 18 Gauge, and an epidural cannula (Epidural mini-pack, Portex). As a local anaesthetic bupivacaine (Marcaina, Pierrel) 0.5% was almost always used, very often diluted with saline solution in order to obtain concentrations varying from 0.125 to 0.375%. Occasionally anaesthetic solutions containing adrenaline 1/200,000 have been used. In sporadic cases mepivacaine (Carbocaina, Pierrel) has been used in concentrations of 0.5-1%. The interspace T_{12}-L_1 was mostly chosen, after careful disinfection of the back of the patient placed in lateral recumbent position, and the epidural space was found by the so-called Dogliotti technique. The epidural cannula was inserted for about 3-5 cms in the cranial direction. After performing aspiration test, anaesthetic volumes, varying from 3 to 6 ml in relation to anatomical and obstetrical factors, were injected. The moment of injection was chosen on the basis of the expressed wish of the patient, and in every case with labour well established. Every patient was monitored through internal cardiotocography after the rupture of the membrane. Labour was generally directed with constant infusion of synthetic oxytocine at average rate of 5 mU/min.

Occasionally a second epidural (lower) catheter was placed when suprapubic or sacrococcigeal pain appeared or persisted and was shown resistant to treatment by upper catheter. In these cases the epidural puncture was practised in the interspace L_5-S_1 and the cahteter was positioned in the caudal direction.

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CASES

In the period 1972-1980 epidural anaesthesia was carried out in the Obstetric Clinic of Padua University on 716 out 21,663 vaginal deliveries. In the five-year period 1972-76 the epidural blocks were 427 out of 16,250 deliveries (2.6 per cent). In 1977, 40 were performed out of a total of 1,476 (2.7%); in 1978, 79 out of 1,388 (5.7%); in 1979, 62 out of 1,269 (4.9%); finally in 1980 there were 108 out of 1,280 (8.4%).

RESULTS

The total of pathological cardiotocographic modifications encountered following epidural blockade was of ten cases, accounted thus:

– bradycardia due to revelation of a caval occlusion (5 cases);

– severe braycardia due to causes not fully ascertained (3 cases);

– bradycardia due to uterine hyperactivity (1 case);

– tachycardia (1 case).

Such alterations of foetal cardiac rate were met in 1.4% of cases.

DESCRIPTION OF THE MOST SIGNIFICANT CLINICAL CASES

Case No. 1: G. E., 27 years old, para 0000, 40th week of pregnancy, 4 cms of dilation. As may be seen in fig. 1 (trace A), five minutes after the injection of the local anaesthetic a bradycardia appeared at an average rate of about 100 b/min., becoming further aggravated by the administration of 0.25 mg of orciprenaline. From the physiological point of view such a cardiotocographic picture is to be ascribed essentially to the severe maternal hypotension due to albeit slight diminution of the peripheral resistances caused by the blocking, even if partial, of the sympathetic thoracic lumbar fibres in an already pre-existent situation of weak compensation. In fact it is very likely that the patient had in action a concealed caval occlusion maintained momentarily in a compensatory phase through an increase of sympathetic tone and a partial recovery of flow from legs and pelvis through the vertebral venous plexus and azygos system. The further maternal hypotension, which in fact caused the aggravation of the foetal bradycardia, was precipitated by the new diminution of the peripheral resistances caused by the administration of orciprenaline, whose inotropic and cronotropric effects on the heart were unable to counterbalance the increased widening of the vascular bed on account of the serious fall in the venous return. The incongruous administration of the betamimetic drug was prescribed with the intention of producing both tocolysis, through uterine relaxation, and beta-stimulation directed to the foetal heart. However, as long as the cause (caval occlusion) was not being removed, its use produced effects diametrically opposite to those desired. Only the correct diagnosis, defined a few minutes later, allowed the resolution of the situation through variation of the decubitus (left side).

Case No. 2: F. M., 25 years old, para 0000, 40th week of pregnancy, 4 cm of dilation. As may be observed in fig. 1 (trace B), five minutes after the administration of the local anaesthetic (bupivacaine 0.375% 4 ml) a slight foetal bradycardia occured lasting 3-4 minutes, followed after 1 minute, by a further analogous episode very short. It is interesting to note how the two bradycardial episodes, spontaneously resolved, were found during a phase of rapid cervical dilation. In fact before performing the epidural block the dilation was 4 cms, while 25 minutes later it was complete. It is possible that the slight foetal bradycardia was derived from the rapid involvement of the part presented, even if there is no proof in support of the hypothesis.

Case No. 3: C. A., 24 years old, para 0000, 40th week of pregnancy, 3 cms of dilation. Epidural block was performed in the interspace L_1-L_2. Mepivacaine 1% (4 ml) was administered via catheter following aspiration test. Already on the appearance of the first uterine contraction (after 3-4 minus) hypertone was noticed contemporaneously with the onset of irregular foetal cardiac trace (fig. 1 trace C) which in the space of five minutes was transformed into a serious bradycardia, resistant to treatment with orciprenaline, though this was successful in reducing uterine hyperactivity. It is possible that uterine hypertone induced by the local anaesthetic caused a slowly reversable state of foetal distress. At birth the infant appeared in excellent condition (Apgar-score 9 at first minute, 10 a 5th).

Case No. 4: G. A., 33 years old, para 0000, 40th week of pregnancy, 3 cms of dilation. After the insertion of the epidural catheter in the interspace L_1-L_2, 6 ml of bupivacaine (0.375%) was administered. After some minutes, foetal tachycardia was manifested, increasing to the rate of 210 b/min (Fig. 1 trace D) and stabilizing after 30 minutes to values of about 190 b/min. This tachycardia lasted for about 80 minutes and coincided, surprisingly, with the duration of the antalgic effect of the first anaesthetic dose. In order to avoid unnecessary risks, further doses were not given. At birht the infant appeared in excellent conditions.

DISCUSSION

The several indications that have appeared up to date in literature on cardiotocographic modifications following epidural anaesthesia refer, in the majority of cases, to anaesthesia conducted with anaesthetics providing unfavourable ratio of haematic foetus/mother concentration, such as lidocaine, or associated to adrenaline, or again in doses not always contained ([4, 5, 6, 7]).

Bupivacaine is certainly the most safe local anaesthetic for obstetric use, above all because of its low ratio of foetus/mother concentration (0.2-0.3) due principally to greater maternal protein binding (90-95%). Also, it demonstrates an excellent sensitive blockade even at low concentrations (0.125-0.375%) ([1]) while the concomitant motor blockade is insignificant. Finally, its long-lasting action allows a notable reduction in the frequency of its administration. Indeed, considering that the aim of segmental epidural block also allows a volumetric saving in anaesthetic solution, it is easy to imagine how the safety index of bupivacaine in relation to the foetus and the dynamic of labour is very high.

It is not to be wondered therefore that during nine consecutive years of experience in using this local anaesthetic, the secondary effects registered were attributable to its administration in only nine cases (in the tenth mepivacaine was used). However it is confirmed that in no case

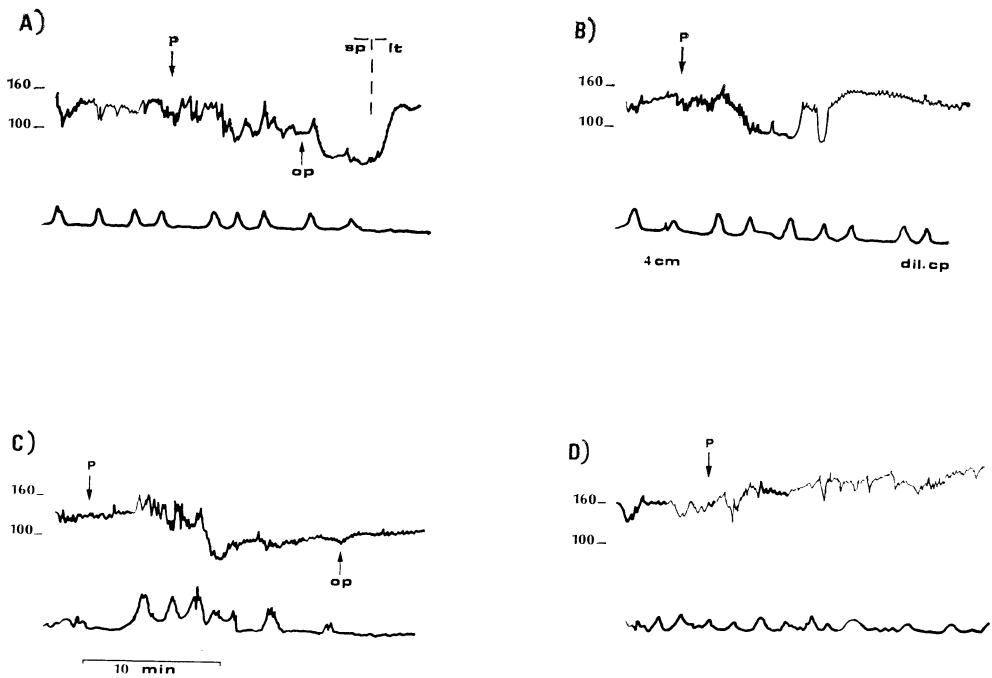

Fig. 1. — Selection of cardiotocographic traces recorded during epidural anaesthesia in labour (description in the text).

Inscription: p: administration of local anaesthetic; op: administration of orciprenaline (i. v.); sp: supine decubitus; lt: lateral decubitus; dilcp: complete dilation.

particular problems were observed in the psycho-physical integrity of the newborn.

It is therefore justifiable to assert that the correct utilization of epidural anaesthesia in labour, conducted with low doses of bupivacaine (15-70 mg per labour) is almost risk-free. The only drawbacks can derive from the revelation of a concealed caval occlusion when maintenance of a constant lateral side is not observed. But if care is taken to avoid the occurence of the supine syndrome it is possible, in our experience, to reduce by half the incidence of undesirable effects on the foetus.

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