Bladder neck mobility and functional evaluation of the pelvic floor in primiparae according to the type of delivery

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Summary

In this study, 91 primiparous women were selected, with a period of post-delivery variable from 45 to 60 days. These patients were divided according to the type of delivery into three groups: I - consisting of 32 patients who had vaginal delivery; II - comprised 29 patients who were subjected to forceps; III - formed by 30 women who were subjected to cesarean section.

Patients with a previous pregnancy were not included, so that the possible previous alterations of the pelvic floor did not interfere with the present evaluation. Patients with a pre-term pregnancy, fetus below 2,500 g or above 4,000 g, anomalous presentations, twin pregnancy, diabetes mellitus, systhemic arterial hypertension, hypertensive disease specific of pregnancy, endocrinopathies and neuropathies were also excluded.

After 45 to 60 days from delivery the patients were subjected to anamnesis, gynecological examination, functional evaluation of the pelvic floor (FEAF), Q-Tip test and ultrasound of the bladder neck.

As for the functional evaluation of the pelvic floor, it was observed that the patients with cesarean section presented better indexes compared to those who were subjected to forceps.

The Q-Tip test showed that in both the patients from group I and group II bladder neck mobility was greater than in those from group III.

Concerning bladder neck topography in relation to public symphysis and its mobility, which were evaluated by ultrasound, it was observed that at rest all the groups had the neck in a supra-pubic position, with no differences among them. Yet, during the required strain, the bladder neck stayed in the infra-pubic position with major frequency in group I. Bladder neck mobility was greater in the vaginal delivery group in relation to the other groups. It was also noticed that the group undergoing cesarean section showed less mobility.

The obtained results lead us to conclude that despite the fact that vaginal delivery may cause displacement of the urethro-vesical junction during strain, and consequently greater bladder neck mobility, it is the attending physician's role to minimize the damage to the pelvic floor, thus avoiding the emergence of a predisposing factor to future stress urinary incontinence.

Key words: Pelvic floor; Urinary incontinence; Pregnancy and delivery.

Introduction

During pregnancy, the maternal organism goes through functional and/or anatomic alterations; the ones which occur in the urinary tract may cause disturbances that sometimes persist after puerperium [1, 2].

Many urogenital alterations appear after childbirth, such as urogenital prolapses, as well as alterations in the pelvic floor, which contribute to the emergence of stress urinary incontinence [3-5].

Pregnancy and vaginal delivery have been considered as the main unleashing factors for the development of stress urinary incontinence [6-8], which is found in 32% to 85% of pregnant or puerperal women [9-11].

Patients subjected to cesarean section may develop stress urinary incontinence [12], which suggests that pregnancy and not delivery is the unleashing factor of major relevance. However, Meyer *et al.* [13] detected stress urinary incontinence in primiparale in 36% after forceps delivery, 21% after vaginal delivery and in 3% after cesarean section. Snooks *et al.* [8] identified loss of urine in 35.7% of the patients five years after vaginal delivery, in addition to malfunctions of the pudendal nerve with persistent muscular weakness.

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Vaginal delivery may cause neurological alterations in the pelvic floor musculature, giving rise to disturbances in the speed of nerve conduction, strength of vaginal contraction and urethral closing pressure, as well as injuries to the suspension and support apparatus [6, 7, 14-16]. Such alterations are not observed after cesarean section [11, 17].

Neurological alterations in the pudendal nerve arising from deliveries persist or even get worse as time goes by [8], and are more evident in those patients undergoing vaginal delivery [6, 15]. However, patients who practice regular perineal exercises after childbirth have greater muscular contraction capacity, independent of the type of delivery [18].

Bladder neck mobility may be evaluated by the Q-Tip test and by ultrasound of the bladder neck. It is accepted that bladder neck hyper-mobility is related to stress urinary incontinence [5, 19, 20].

It has also been verified that in women who had vaginal deliveries the bladder neck is lower than after cesarean section, both at rest and during straining [13, 15].

As it can be inferred from the literature analysis, several alterations occur in the urinary tract during the gravidic-puerperal cycle, which may determine the development of urinary disturbances, among which stress urinary incontinence stands out. Nevertheless, there are few studies eval-

uating the alterations which occur in the pelvic floor and in bladder neck mobility according to the type of delivery. These facts aroused our interest in studying this topic.

Materials and Methods

Ninety-one primiparous women were selected with a period of post-delivery varying from 45 to 60 days. Just term-pregnancy primiparale were included. They were divided according to the type of delivery into three groups: I - 32 patients who had vaginal delivery; II - 29 patients who were subjected to forceps; III - 30 women who underwent cesarean section.

Patients with a previous pregnancy, pre-term pregnancy, fetus below 2,500 g or above 4,000 g, anomalous presentations, twin pregnancy, pathological puerperium, diabetes mellitus, systhemic arterial hypertension, hypertensive disease specific of pregnancy, endocrinopathies and neuropathies were not included.

The groups were homogeneous for race, age, weight gain during pregnancy, duration of labor and the newborn weight.

After 45 to 60 days from delivery a gynecological examination, functional evaluation of the pelvic floor [21] (Table 1), the Q-Tip test [22] and ultrasound of the bladder neck were performed.

Table 1. — *Functional evaluation of the pelvic floor [21].*

Palpation of the anus elevator muscle; the patient is asked to contract and hold the muscular contraction;
degree 0 - without objective perineal function, not even on palpation;
degree 1 - objective perineal function absent, just noticed on palpation;
degree 2 - objective perineal function weak, noticed on palpation;
degree 3 - objective perineal function and opposing resistance not held on palpation;
degree 4 - objective perineal function and opposing resistance held on palpation greater than 5 seconds.

Ultrasonography with the patient in the lithotomy position was accomplished with the bladder comfortably full. A 6.0 MHz electronic sectorial endovaginal transductor in the sagital position was used, and it was wrapped in a condom lubricated with sonic gel, placed just below the clitoris, without entering the vagina, allowing the identification of the pubic symphysis, the urethra, the bladder neck and the bladder.

The distance between the urethro-vesical junction and the inferior edge of the pubic symphysis was measured at rest. After that, the patient was asked to perform the Valsalva maneuver, and the new distance between these new structures was measured in millimeters. Mobility was worked out either by adding up the infrapubic position to the suprapubic one or by subtracting when the neck remained suprapubic, both at rest and during strain, as well as when it always stayed infrapubic.

All the patients agreed to participate in the study, which was approved by the Commission of Ethics in Research of our Institution.

The results were statistically analyzed by the variance homogeneity test, variance analysis, Tukey multiple comparisons test, Kruskal-Wallis test and multiple comparisons test [23].

In all the tests the level of rejection of the nullity hypothesis was fixed in 0.05 or 5% (α smaller than or equal to 0.05), with significant values signaled by asterisks.

Results

There were two patients with urinary loss after childbirth, both of them from the cesarean group, who were subjected to urodynamic studies revealing detrusor instability. However, approximately three months after the delivery, they no longer complained about urinary loss.

The index of functional evaluation of the pelvic floor was 2.3 in the vaginal delivery group, 2.2 in the forceps group and 2.8 in the cesarean group. It was observed that the patients undergoing cesarean section presented better indexes compared to those where forceps were used ($p = 0.031$).

By the Q-Tip test, it was observed that the position of the bladder neck at rest was similar in the three groups, being 20.8° in the vaginal delivery group, 17.0° in the forceps group and 14.8° in the cesarean group (Table 2). Nevertheless, in the vaginal delivery group during strain a greater excursion of the tip's stem occurred, with the resulting angle being greater than the one observed in the cesarean group. Thus, it was detected that both the patients with vaginal delivery and those subjected to forceps presented greater bladder neck mobility in relation to patients undergoing cesarean section (Table 2).

In relation to the ultrasound of the bladder neck, it was verified that at rest the bladder neck was in the suprapubic position in all the groups with no differences among them. On the other hand, during the required strain, the bladder neck stayed in the infrapubic position with greater frequency in the vaginal delivery group. Bladder neck mobility was greater in the vaginal delivery group in relation to the other ones. It was also noticed that the group which was subjected to cesarean section presented less mobility (Table 2).

Table 2. — *Position of the bladder neck at rest (res), during strain (str) and its mobility (mob) evaluated by the Q-Tip test (in degrees) and by ultrasonography (in millimeters), according to the type of delivery.*

	Group I Vaginal			Group II Forceps			Group III Cesarean		
	res	str	mob	res	str	mob	res	str	mob
Q-Tip test (in degrees)									
Average	20.8	55.9	35.1	17.0	48.7	31.7	14.8	38.6	23.8
Standard error	1.7	1.8	1.7	2.3	3.6	2.2	2.0	3.2	2.4
Ultrasonography (mm)									
Average	19.5	-1.2	20.7	19.5	3.1	16.3	21.3	9.5	11.8
Standard error	0.6	1.0	1.1	0.6	1.3	1.2	0.7	1.2	0.9

Q-Tip test - Bladder neck mobility. Variance analysis: $p = 0.002$*. Tukey's multiple comparisons test: Vaginal delivery > Cesarean (3.79; 18.00)*. Vaginal delivery = Forceps (-3.76; 10.57). Forceps > Cesarean (-14.77; -0.21)*.

US bladder neck - Mobility. Variance analysis: $p < 0.001$*. Vaginal delivery > Cesarean (5.00; 12.31)*. Vaginal delivery > Forceps (0.62; 8.00)*. Forceps > Cesarean.

Discussion

Urinary incontinence is closely linked to pelvic floor damage, either muscular or nervous, and it is known that the type of delivery affects this musculature in an objective way [9, 11].

Several authors have reported alterations of the pelvic floor deriving from delivery such as decreased contraction strength and muscular and neurological injuries, which cause anatomical and/or functional damage [7, 14, 16]. The authors report that these alterations not were observed after cesarean section [11, 17].

In our evaluation, women subjected to cesarean section presented better indexes in the functional evaluation of the pelvic floor (FEF) when compared to those who had vaginal or forceps deliveries, demonstrating greater contraction strength and muscular integrity. Therefore, after vaginal or forceps delivery anatomical and functional alterations of the pelvic floor occur. Such alterations may persist from six months [6, 15] up to five years after vaginal delivery [8].

In relation to the Q-Tip test, we identified greater bladder neck mobility in the groups undergoing vaginal deliveries and smaller mobility in the groups undergoing cesarean sections. A few authors in the literature have evaluated puerperant women by the Q-Tip test. Among them, Pisera *et al.* [5] also registered a high incidence of positive tests (40%) six months after vaginal delivery, with these patients also presenting decreased perineal musculature contraction strength. Previously, Pregazzi *et al.* [19] found positive Q-Tip tests in just 12.5% of the women after vaginal delivery, although 85.7% of these patients were incontinent. Such a fact confirms the association existing between neck mobility and stress urinary incontinence.

Bladder neck hypermobility was confirmed in the vaginal delivery and forceps groups, both by ultrasonographic evaluation and by the Q-Tip test. Such a finding allows us to presuppose that these patients will have one of the risk factors of future stress urinary incontinence.

On the other hand, women who practiced perineal exercises in the post-delivery period should have greater muscular contraction strength, independent of the type of delivery [18], suggesting that muscular alterations can and should be reverted. Thus it should be emphasized that perineal exercises should be taught to pregnant and puerperal women to minimize any alterations which may derive from delivery.

Therefore, despite the fact that vaginal delivery may give rise to displacement of the urethro-vesical junction during straining and, as a consequence, greater bladder neck mobility, it is the attending physician's role to minimize the damage to the pelvic floor, thus avoiding the emergence of a predisposing factor to future stress urinary incontinence.

It is known that maternal morbidity is more frequent in the post-delivery period by the abdominal route than by the vaginal route which results from a high incidence of infection, hemorrhage or anesthetic accidents. Fetal prognosis can also be affected by cesarean section, thus increasing the incidence of premature deliveries and hyalin membrane syndrome.

This is an initial study on the evaluation of pelvic floor alterations according to the type of delivery. It must be complemented by other studies which evaluate a greater number of patients with a longer follow-up period, and the usefulness of perineal exercises before and after delivery.

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