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SCIENTIFIC ARTICLE

There is High Incidence of Skin Cells in the First and Third Drops of Cerebrospinal Fluid in Spinal Anesthesia

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Abstract

Background and objectives: Skin fragments during lumbar punctures may develop intraspinal epidermoid tumors. The aim of this study was to determine the incidence of epithelial cells that reflow along with the first and third drops of CSF of patients undergoing spinal anesthesia.

Methods: Samples of the first and third drops of cerebrospinal fluid were collected from 39 adult patients undergoing spinal anesthesia with a 25G Quincke needle. Four microscope slides were prepared: one for the first drop, one for third drop, one for the needle, and one with a drop of saline for control. A pathologist examined the slides randomly.

Results: Squamous epithelial cells were identified in 35 (89.7%) samples from the first drop, 34 (87.2%) from the third drop, and 24 (61.5%) from spinal needle. The third drop showed a mean number of cells larger than the first drop ($p = 0.046$). Nucleated epithelial cells were found in a sample of the first drop (2.56%), in four samples of third drop (10.25%), and in one spinal needle (2.56%). Third drop showed a mean number of nucleated cells higher than first drop with no statistical difference ($p = 0.257$).

Conclusions: High percentage of epithelial cells was found in the first (89.7%) and third (87.2%) drops of CSF reflow and in used needles (61.5%). Skin cells were found even using small gauge disposable needles with well-adapted mandrel,

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Introduction

Epidermoid tumors of the central nervous system and spinal canal are very rare^{1,2}. These tumors' etiology may be congenital or iatrogenic, being generated by epidermal cells implantation into the spinal canal. Iatrogenic spinal epidermoid tumors derive from epidermal tissue implantation inside the spinal canal during lumbar puncture performed with needles without mandrel or with inappropriate or maladaptive mandrel³. In 1962, a review of 90 cases of spinal epidermoid tumors reported that 41% of tumors had iatrogenic origin for different reasons⁴. More than 40 years ago, two different research groups reproduced epidermoid tumors experimentally by implanting autologous skin fragments into the medullary canal⁵⁻⁷.

In skin puncture during spinal anesthesia or even caudal anesthesia, the needle tip without mandrel acts as a lancet, produces a biopsy and introduces these fragments within the spinal canal, resulting in the onset of epidermoid tumors^{8,9}. An evaluation of the presence of skin cells and debris in small caliber disposable needles with well-adapted mandrels showed that such fragments may be readily detected in needles most used in spinal anesthesia^{10,11}. Some authors recommend letting a few drops of cerebrospinal fluid (CSF) drip by the hub of spinal needles in order to clean them of any debris or other contaminants¹¹.

Knowledge of CSF cellularity, ignored in subarachnoid punctures, may suggest the number of drops required to wash the mandrel and if this procedure is effective or not in reducing the incidence of epidermoid tumors. The objective of this randomized, double-blind study was to evaluate the incidence of skin cells in CSF inside spinal needle hubs (Quincke 25G) and if there is any difference between the amounts of epidermal material reflowing with the first and third drops of CSF.

Method

After receiving approval by the Research Ethics Committee and obtaining signed informed consent, we collected samples of CSF from 25G Quincke spinal needles used in 39 patients, male and female, ASA I-II, aged between 20-80 years, undergoing surgery (gynecologic, urologic, orthopedic, and general) under spinal anesthesia. Anesthesiologists blinded to the study administered the anesthesia.

All needles used were 25G Quincke (BD-Becton, Dickinson and Company) with mandrels. Before puncture, the mandrel was checked for proper adaptation to the set. Patients were

anesthetized in the sitting position after intravenous administration of midazolam (2.0 mg) and fentanyl (25 mcg). After asepsis with alcohol solution, anesthetic button was performed with lidocaine (20 mg) without vasoconstrictor, using an insulin needle. After subarachnoid puncture with 25G Quincke needle and presence of CSF returning in the needle's hub, the first and third drops were collected in separate slides. The number of punctures for obtaining CSF was registered. Then, the local anesthetic previously chosen for the surgery was injected. The needle was withdrawn without the mandrel, its interior washed with injection of 0.2 mL alcohol 70% and stored in a test tube, from which a third slide would be made by centrifugation in the institution laboratory.

The two slides containing the first and third drops were identified and registered. A fourth slide was identified as control with a drop of 0.9% saline solution, and the fixer used in the others. The slides used contained a field of 1 cm² to delimit the drops of the CSF. All material was stored in a suitable container and sent for cytological analysis by a pathologist who was blinded to the study. Analysis included assessment for the presence and amount of cells and/or epithelial tissues or other biological material (tissue or fatty tissue) unsuitable to CSF.

For statistical analysis, we used Excel program for creating a database and SPSS for analysis; nonparametric Wilcoxon test was used to compare the number of cells found in every drop and test the relationship between the number of punctures and number of cells found; in addition to regression. The tests were performed with 95% confidence interval and 5% standard error, with $p < 0.05$ considered statistically significant.

Results

Regarding gender, the sample was evenly distributed with 53.8% female and 46.2% male, mean age of 46.51 ± 18.40 years (range 20-80 years).

Epithelial cells and other debris were found in the first and third drops of CSF and needle. Spinal carcinoma cells were found in 35 (89.7%) in the first drop; 34 (87.2%) in the third drop; and 24 (61.5%) in spinal needles used. Nucleated epithelial cells were found in one (2.56%) in the first drop; four (10.25%) in the third drop; and two (2.56%) in spinal needle. Portions of connective and fat tissue were identified in five (12.8%) in the first drop; three (7.69%) in third drop; and three (7.69%) in the needle. There were no epithelial cells or fragments in control slides (Table 1).

Table 1 Epithelial Cells and Other Debris Found in the First and Third Drops, Needle, and Control.

	1 st Drop n = 39	3 rd Drop n = 39	Needle n = 39	Control n = 39
Epithelial cells (squamous)	35 (89.7%)	34 (87.2%)	24 (61.5%)	0 (0%)
Epithelial cells (nucleated)	1 (2.56%)	4 (10.25%)	1 (2.56%)	0 (0%)
Fragments (connective and fat tissue)	5 (12.8%)	3 (7.69%)	3 (7.69%)	0 (0%)

Table 2 Mean and SD of Different Cells Found in the First and Third Drops and Needle.

	1 th Drop n = 39	3 rd Drop n = 39	Needle n = 39	p value
Epithelial cells (squamous)	16.00 (18.21)	21.62 (19.14)	4.72 (5.74)	p=0.046
Epithelial cells (nucleated)	0.10 (0.64)	0.18 (0.60)	0.08 (0.48)	p=0.257
Other cells	0.13 (0.34)	0.08 (0.27)	0.08 (0.27)	p=0.414

There was a significant difference ($p = 0.046$) between the mean squamous epithelial cells in the first and third drops and no difference between the first and third drops regarding nucleated epithelial cells. Likewise, there was no significant difference regarding other cells in the first and third drops (Table 2).

Regarding the number of punctures, there was incidence of 69.2% with one puncture, 15.4%, with two punctures, 5.6% with three punctures, 2.6% with four punctures, and 7.7% with five punctures. Linear regression correlating the number of punctures with the amount of cells showed no significant difference at all time points ($p < 0.05$).

Discussion

In this study, a high percentage of epithelial cells was found in the first and third drops, as well as in the needle (89.7%, 87.2%, and 61.5%, respectively).

In 1944, during an assessment of the CSF of meningitis patients undergoing multiple subarachnoid punctures, researchers found the presence of squamous epithelial cells together with staphylococci and occasionally small cylindrical skin fragments from spinal needles¹². Twelve years later, there were reports of increased incidence of epidermoid tumors in five patients with history of meningitis that had undergone multiple punctures¹³. The ratio of iatrogenicity in the onset of these tumors occurred with the publication of four cases of adult patients with previous normal myelography that developed squamous cell tumor at the site of subarachnoid puncture¹⁴⁻¹⁷.

A comparison of 25G disposable spinal needles, in which it was not possible to identify the subarachnoid space, showed tissue fragments in 80% of the Quincke needles compared to 41% of the Whitacre needles¹¹. In 27% of Quincke needles and 12% of Whitacre needles, fragments larger than the needles' diameter were found. In this study, in which the subarachnoid space was identified in all patients, the presence of epithelial cells occurred in 89.7% in the first drop, 87.2% in the third drop, and 61.5% in the needle hub, while no cells were found in the control group.

Due to the high incidence of tissue fragments in 25G spinal needles (Quincke and Whitacre), letting CSF drip from the needle before local anesthetic injection was recommended believing that a few drops of CSF would wash away any fragments of tissues¹¹. However, the high incidence of cells found on the first (89.7%) and third (87.2%) drops of CSF from the needle contradicts this theory.

This study showed the high incidence of epithelial cells found in CSF outflows both in the first and third drops, as well as in the 25G sharp tip needles. We cannot correlate the morbidity caused by these cells, as it was not the object of the study.

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