Rectal Bioelectrical impedance (REBI) as a possible screening tool for colorectal cancer (CRC)

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Introduction: There are two main methods widely used for CRC screening: Fecal occult blood tests (FOBT) and total colonoscopy (TC). Although not very expensive, the former lacks of good sensitivity and specificity, whereas the latter is expensive and not very well accepted by the general public. We hypothesize that REBI could be a good candidate for CRC screening or prescreening purposes based on two main concepts: a) known evidence that intestinal mucosal permeability increases with CRC, which should decrease the electrical impedance of the mucosa, and b) the theory of field carcinogenesis, which states that there is a wide cell transformation affecting whole organs or systems before cancer appears, allowing to interrogate more accessible parts of organs or surrogate organs that mirror what is going on in organs prone to or already affected by carcinogenic alterations.

Methods: 77 volunteers scheduled in a private clinic for total colonoscopy due to varied gastrointestinal symptoms participated in this initial study. It was approved by the Ethics Committee of the Universidad de Caldas and all volunteers signed an informed consent. Prior to starting the colonoscopy a plastic anoscope was used to introduce the electrical probe and take readings under direct vision in 4 cardinal points on the rectal mucosa of the lower rectum. This process took less than 2 minutes, the colonoscopist proceeded immediately after to perform the colonoscopy and the results were later correlated with the REBI data.

Results: 35 out of the 77 volunteers (27 male, 8 females; overall age range 18-89 y, median 46 y) were diagnosed either as normal (n = 28) or with cancer (n = 7: 3 in colon and rectum each, 1 in the anus). Statistical analysis showed that there was no significant difference between readings taken in the four sites selected for this study (P = 0.90). Resistivity was different at all frequencies between both groups (Fig. 1), being lower in those with cancer, as expected (6.1 and 5.1 Ωm at 4.7 kHz and 4.6 and 4.0 Ωm at 614.4 kHz).

Conclusion: The results of this study are very encouraging in that they seem to show that, irrespective of the site of CRC, there is a decrease in the passive electrical properties of the rectal mucosa in persons with CRC. This could probably be due to a decrease in mucosal permeability associated to changes in the nanoarchitecture of tight junctions, one of the possible manifestations of colon field carcinogenesis. We propose, therefore, that EIS can be another alternative to explore for CRC screening.

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