NO-AIR-PLASMA CURRENTS AND OZONE THERAPY IN TREATMENT OF PATIENTS WITH DIABETIC FOOT SYNDROME

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Disclosures

Nothing to disclose
AIM OF OUR RESEARCH

To determine the effect of joint use of NO-air-plasma currents and ozone therapy on cellular elements and the level of bacteriological contamination of wounds occurring as a result of diabetic foot syndrome.
OUR MATERIALS AND METHODS:

Outcomes of the treatment of 105 patients that underwent corrective surgery on major vessels of lower limbs with surgical complications of the neuro-ischemic form of the diabetic foot syndrome: purulent-necrotic wounds.

60 males, 45 females; Average age 63,9±9,7 years
OUR MATERIALS AND METHODS

Stage (Wagner-Meggitt classification)
OUR MATERIALS AND METHODS

Microbiological characteristics of wounds

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Mixed microflora</td>
<td>83.3%</td>
</tr>
<tr>
<td>Monoculture</td>
<td>11.7%</td>
</tr>
<tr>
<td>Growth of microorganisms is not revealed</td>
<td>5%</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>61%</td>
</tr>
<tr>
<td>Staphylococcus epidermidis</td>
<td>27%</td>
</tr>
<tr>
<td>Bacteroides fragilis</td>
<td>21%</td>
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<tr>
<td>Peptococcus spp.</td>
<td>17%</td>
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<tr>
<td>Pseudomonas aeruginosa</td>
<td>7%</td>
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<tr>
<td>The degree of initial contamination of wounds</td>
<td>$10^7$</td>
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OUR MATERIALS AND METHODS

All patients underwent correction of glycemia, antibacterial, angioprotective and neuroprotective therapy.

Patients in the study group (57 – 54,3%) wounds on the feet handled consistently NO-air-plasma flows and the ozone-oxygen gas mixture.

In the comparison group (48 – 45,7% patients) was conducted traditional local treatment with antiseptics and water-soluble antibacterial and enzymatic ointments.
OUR MATERIALS AND METHODS

Study group: the NO-air-plasma flows and the ozone therapy.
OUR MATERIALS AND METHODS

NO-air-plasma flows:

- total bactericidal effect
- “vaporization” of the necrotizing tissues
- intensification of utilization of oxygen in tissues
- endothelium-protective action
- stimulation of the connective tissue growth
Ozone therapy:

- antimicrobial, fungicidal and antiviral effects
- immunomodulating effects
- intensification of microcirculation
- improvement of the rheological blood properties
- normalization of the processes of lipid peroxidation and antioxidant protection
- increasing of blood oxygenation and reduction of tissue hypoxia
Step I: The method of wound treatment by NO-containing air-plasma flows.
Step II: The methods of treatment the wound surface ozone-oxygen mixture in the camera outdoor irrigation.

Step II

O₃-therapy

20 min.
40 mg/l, 0,5 l/min
OUR MATERIALS AND METHODS

Control methods:

• bacteriological parameters on 5, 9 and 12 days;

• the proliferative activity of fibroblasts and epithelial cells on 5, 7, 9 and 12 days.
RESULTS

Microbial colonization of wounds
RESULTS

The proliferative activity of fibroblasts

<table>
<thead>
<tr>
<th>Time</th>
<th>Control</th>
<th>Study group</th>
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<tbody>
<tr>
<td>1 day</td>
<td>1.44</td>
<td>1.67</td>
</tr>
<tr>
<td>7 day</td>
<td>2.81</td>
<td>3.91</td>
</tr>
<tr>
<td>9 day</td>
<td>4.05</td>
<td>6.44</td>
</tr>
<tr>
<td>12 day</td>
<td>5.19</td>
<td>8.82</td>
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RESULTS

The proliferative activity of epithelial cells

![Bar chart showing the proliferative activity of epithelial cells over time, with indicator values for both control and study group.](chart.png)
RESULTS

Terms of wound healing

- **15 day**
  - Study group: 12%
  - Control: 6%

- **30 day**
  - Study group: 74%
  - Control: 19%

- **60 day**
  - Study group: 14%
  - Control: 31%

- **> 60 days**
  - Study group: 0%
  - Control: 44%
RESULTS

Relapse rate of infectious complications:

Study group – 3 patients (5.4%)

Control group – 11 patients (22.9%)
Conclusion

Sequenced application of NO-air-plasma currents and ozone therapy in treatment of patients with diabetic foot syndrome is characterized with pronounced bactericidal effect and boosts epithelialization process, making it two times faster.
Study Personnel:

Surgeons - V.N. Obolenskiy\textsuperscript{1,2}, A.Yu. Molotschnikov\textsuperscript{1}
Nurses – A.V. Markova\textsuperscript{1,2}, S.V. Perova\textsuperscript{1}, M.V. Murzaeva\textsuperscript{1}

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Department of wounds and wound infections
Thank you for your attention!