The clinical and aesthetic advantages of using Multi Micro Alveolar Stimulation during recovery from caesarean section

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At present, the most frequent operative intervention is the caesarean section (C-section), which accounts for up to 31.3% of the overall number of births in the Russian Federation [1]. Worldwide trend analysis shows an increase in the frequency of operative delivery over the past few decades. There is a large number of repeat births by C-section. Another worldwide trend is delayed motherhood, which in and of itself increases the frequency of operative delivery, but also adversely impacts the healing of post-operative wounds, especially when the mother is obese, has metabolic disorders, an increased likelihood of distension of the anterior abdominal wall, or repeated intromission in the abdominal cavity [2].

Four stages are distinguished per the clinical morphological classification of uncomplicated surgical wound healing by primary intention: postoperative inflammation and epithelialisation (first 7-10 days), fibrillogenesis and primary scar formation (10-30 days after operation), durable scar formation (30-90 days), final transformation (4-12 months) [3,4,5,6]. Physiotherapy is especially effective during the first two stages of healing, since it is here that the trophic and reparative processes play the greatest role [7,8,9]. Multi Micro Alveolar Stimulation (MMAS) with the icoone® Laser Med device is already possible 72 hours after the operative intervention because it is a non-invasive physiotherapeutic treatment, which aligns with the time that the patient is discharged from the maternity ward.

Purpose: assess the efficacy, safety, and tolerance of Multi Micro Alveolar Stimulation in early stages of wound healing of the anterior abdominal wall after caesarean section.

Objectives:

1. Study the healing dynamics of postoperative wounds of the anterior abdominal wall with and without the use of Multi Micro Alveolar Stimulation, assessing the following criteria: hyperaemia, puffiness, sensation, tenderness, and scar thickness
2. Conduct a survey of the patients' subjective feelings with regard to healing and the return of sensation around the postoperative wounds in both groups of patients
3. Assess tolerance of the icoone® Laser Med sessions, presence or absence of discomfort during the procedures and patient satisfaction with the results
4. Objectivise the results of the Multi Micro Alveolar Stimulation physiotherapeutic treatment on wound healing, comparing ultrasound data of postoperative wounds and scars of the anterior abdominal wall
5. Define the group of patients for whom Multi Micro Alveolar Stimulation has the greatest clinical and aesthetically significant effect

The study design is given in Figure 1.

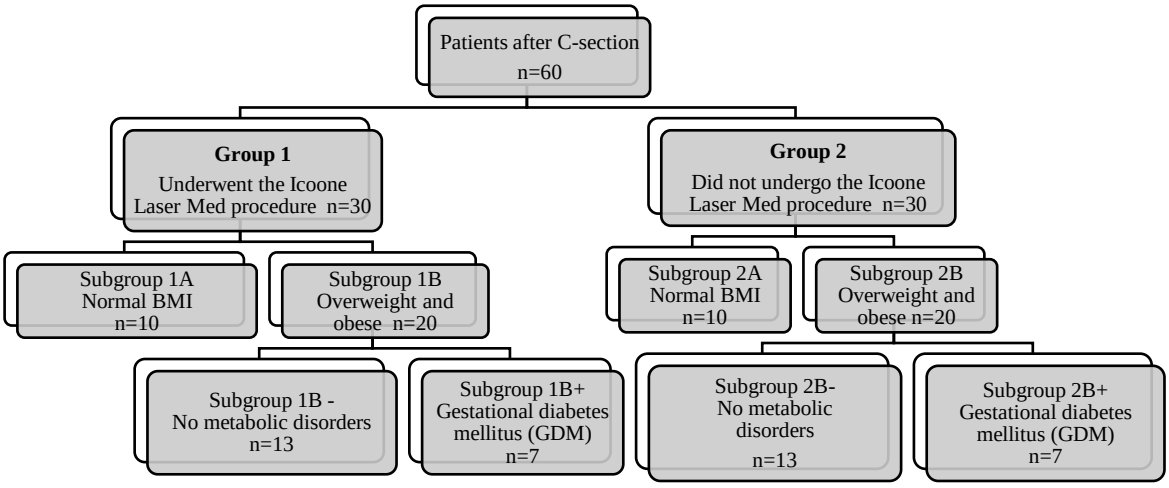


Figure 1. Study design

Materials and methods:

The study was conducted at OOO Medical Centre "Zdorovaya Planeta" in a postpartum recovery programme using icoone® Laser Med device.

In total, 60 patients who had C-sections participated in the late postpartum period. The thirty women in Group 1 underwent rehabilitation treatment with the icoone® Laser Med device; the thirty women in Group 2 did not undergo this therapy. Seven sessions for the thirty women in Group 1 were provided with a frequency of 3 sessions per week.

Inclusion criteria:

First operative intervention
Planned operative delivery
One foetus weighing from 2500-4000 g
Normal amniotic fluid index
Low parity
18 to 35 years of age
An essential criterion for inclusion in the core group was an understanding of the instrumental intervention mechanics, belief in the effect, and willingness to undergo at least three procedures

Exclusion criteria:

Repeat operative intervention
Emergency or urgent delivery
Foetus weight less than 2500 g or greater than 4000 g
Hydramnios or oligohydramnios
Pluripara
Infection-related complications with regard to the postoperative wound
Chronic illnesses in the stage of decompensation

During the first patients' visit (7 days after C-section) to the clinic, each one was examined by a therapist and an obstetrician-gynaecologist. The specialists carefully obtained medical histories to ensure the selection of patients meeting the study's inclusion and exclusion criteria. Patients'

preferences were taken into consideration, all were given recommendations on proper nutrition and behaviour in the postpartum period, to include wearing the binder. If the women were willing and able to take part in the study, all were asked to sign informed voluntary consent forms. If required, an endocrinologist offered consultations with the women, and the patients in the core group of the study had consultations with a specialist in instrumental approaches. All patients had their body mass index calculated and bioimpedance analysis taken, an obstetrician-gynaecologist conducted a clinical assessment of the postoperative wound condition, took photographs of the postoperative wound, and to objectively analyse the healing, ultrasound imaging of the postoperative scar of the anterior abdominal wall was performed.

A subjective assessment by the patients of the condition of their postoperative wounds was done using the POSAS (Patient and Observer Scar Assessment Scale) (annex 1) [10]. Based on the initial medical history, the first procedure was performed using the icoone® Laser Med device.

During the second visit of patients in the core group (on the third day of the study, 9 days into the postpartum period), a clinical assessment of the healing dynamics of the postoperative wound was conducted along the following parameters: hyperaemia, puffiness, thickness, tenderness upon palpation, photographs were taken, the patients were surveyed regarding their subjective sensations: discomfort around the postoperative wound, tenderness while moving, sensitivity, satisfaction with the cosmetic effect.

In the core group the survey also included: tolerance of the procedure, side effects.

At the end of these evaluations, the second icoone® Laser Med session was performed.

The third visit of patients in the core group (fifth day of the study, 11 days after the operation):

- Clinical assessment of the healing dynamics of the postoperative wound by the obstetrician-gynaecologist
- Photography
- Survey
- Third session with the device

The fourth visit of patients in the core group (eighth day of the study, 14 days after the operation):

- Clinical assessment of the healing dynamics of the postoperative wound by the obstetrician-gynaecologist
- Photography
- Survey
- Fourth session with the device

The fifth visit of patients in the core group (eleventh day of the study, 17 days after the operation):

- Clinical assessment of the healing dynamics of the postoperative wound by the obstetrician-gynaecologist
- Photography
- Survey
- Fifth session with the device

The sixth visit of patients in the core group (14th day of the study, 20 days after the operation):

- Clinical assessment of the healing dynamics of the postoperative wound by the obstetrician-gynaecologist

- Photography
- Survey
- Sixth session with the device

The seventh visit of patients in the core group (17th day of the study, 23 days after the operation):

- Clinical assessment of the healing dynamics of the postoperative wound by the obstetrician-gynaecologist
- Photography
- Survey
- Seventh session with the device
- Ultrasound imaging of the postoperative scar

Patients in the Group 2 did not undergo the sessions with the icoone® Laser Med device, but they saw the obstetrician-gynaecologists at the "Zdorovaya Planeta" medical centre under the "Postpartum Recovery" programme.

Some of the results of the icoone® Laser Med device intervention are shown in Figures 2,3,4, 5.

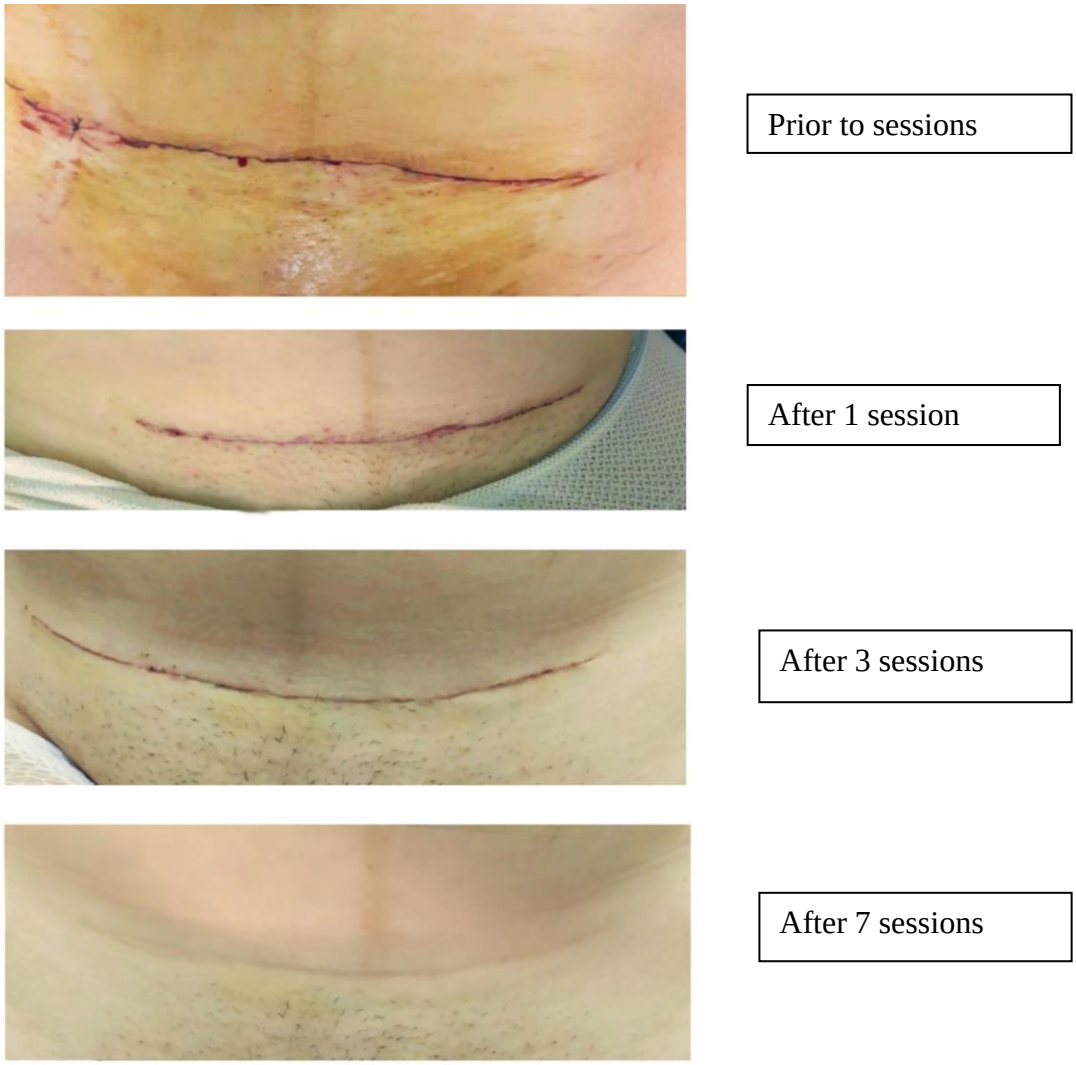
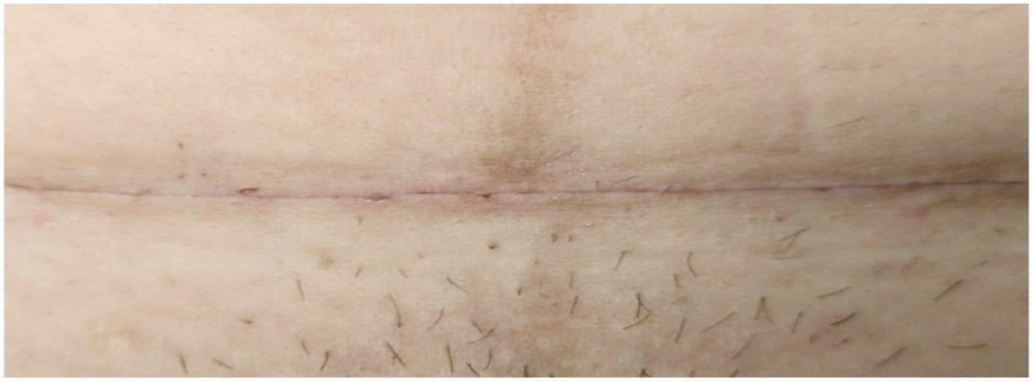


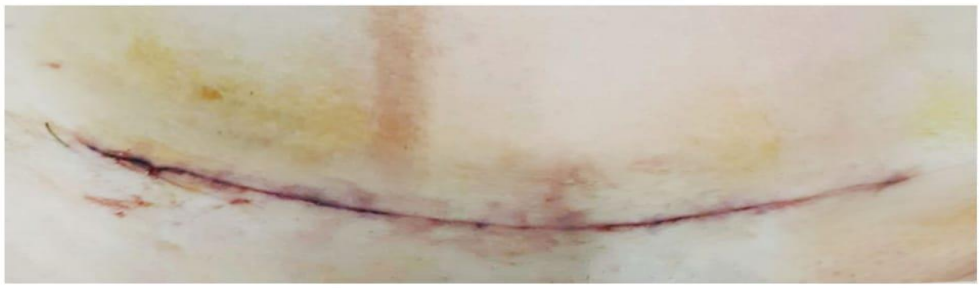
Figure 2 – Patient A: third day post-partum (prior to icoone® Laser Med session); seventh day post-partum (after 1 icoone® Laser Med session); eleventh day post-partum (after 3 icoone® Laser Med sessions); twenty-third day post-partum (after 7 icoone® Laser Med sessions)



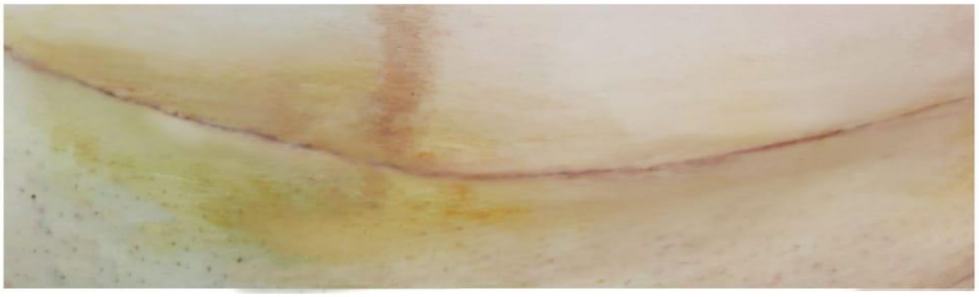
Prior to session

After 5 sessions

Figure 3 – Patient B: seventh day post-partum; seventeenth day post-partum (after 5 icoone® Laser Med sessions)



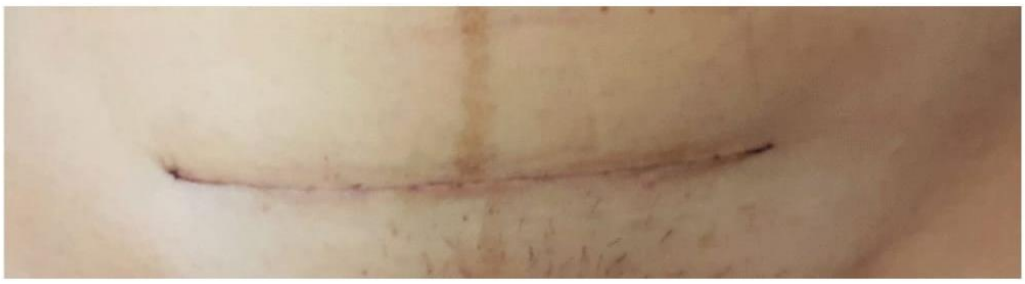
Prior to session



After 2 sessions

After 7 sessions

Figure 4 – Patient C: third, ninth (after 2 icoone® Laser Med sessions) and twenty-third days post-partum (after 7 icoone® Laser Med sessions)



Prior to session

After 7 sessions

Figure 5 – Patient D: seventh and twenty-third days post-partum (after 7 icoone® Laser Med sessions)

In Figures 6,7, 8 for comparison of the two groups (Group 1 and Group 2) the photographs of the patients comprising Group 2 are shown (these patients did not undergo the procedure with the icoone® Laser Med device).

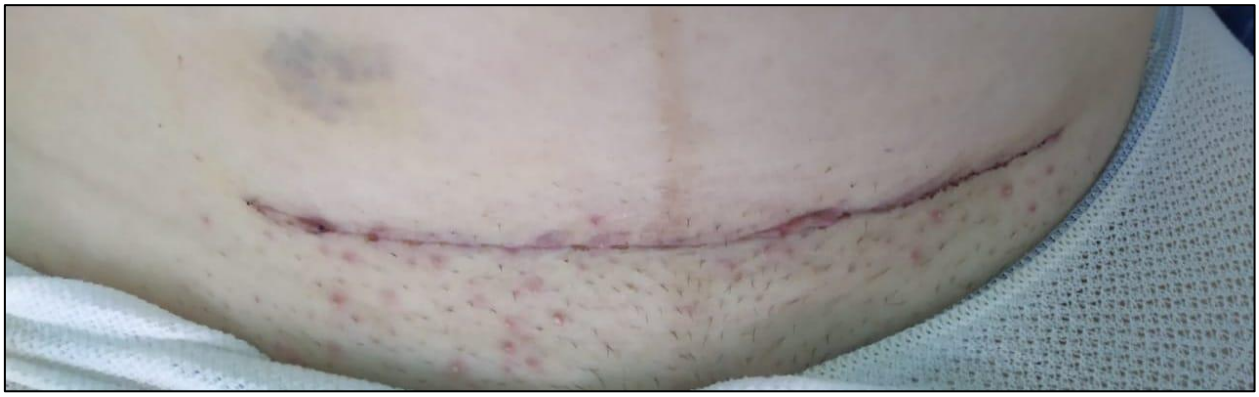


Figure 6 – Patient E – seven days after delivery

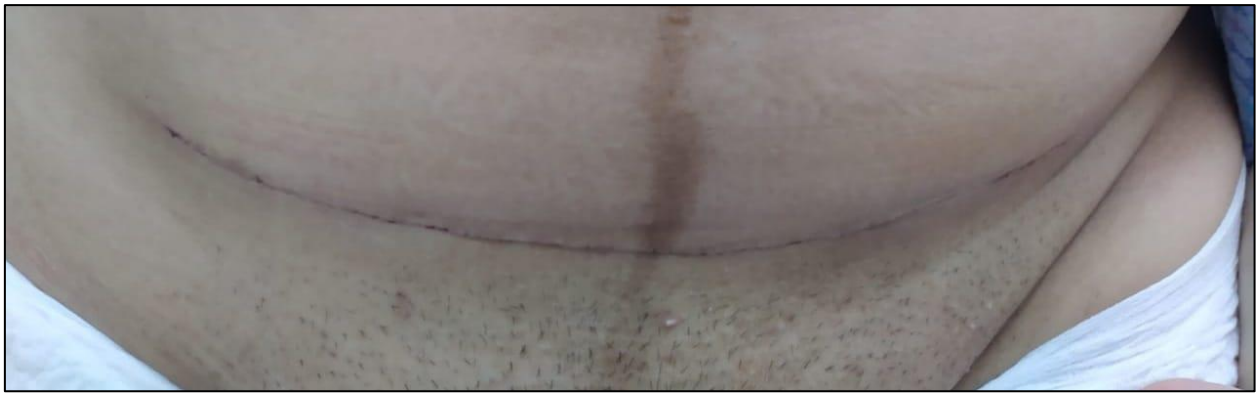


Figure 7 – Patient F – fourteen days after delivery

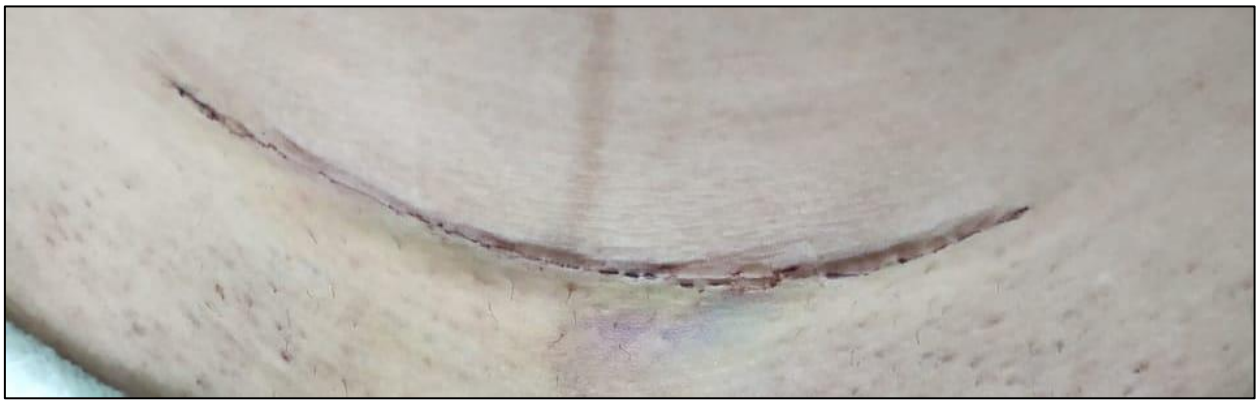


Figure 8 – Patient G – nine days after delivery

Overall assessment of scar appearance expressed by patients on a scale of 1 to 10.
The results are given in Figure 9.

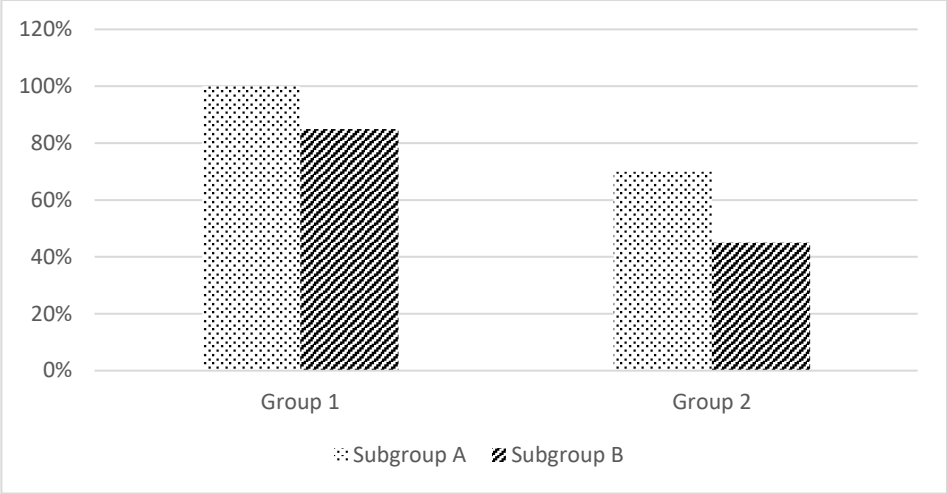


Figure 9. Patient satisfaction with the appearance of the scar that formed

Subjective assessment by the patients of scar healing as per POSAS – points assigned from 6 to 35.

Best possible (6 to 9 points)
Good (10-12 points)
Satisfactory (13-20 points)
Unsatisfactory (21-35 points)

Graphical result showing the advantage of using the device approach is given in Figure 9.1.

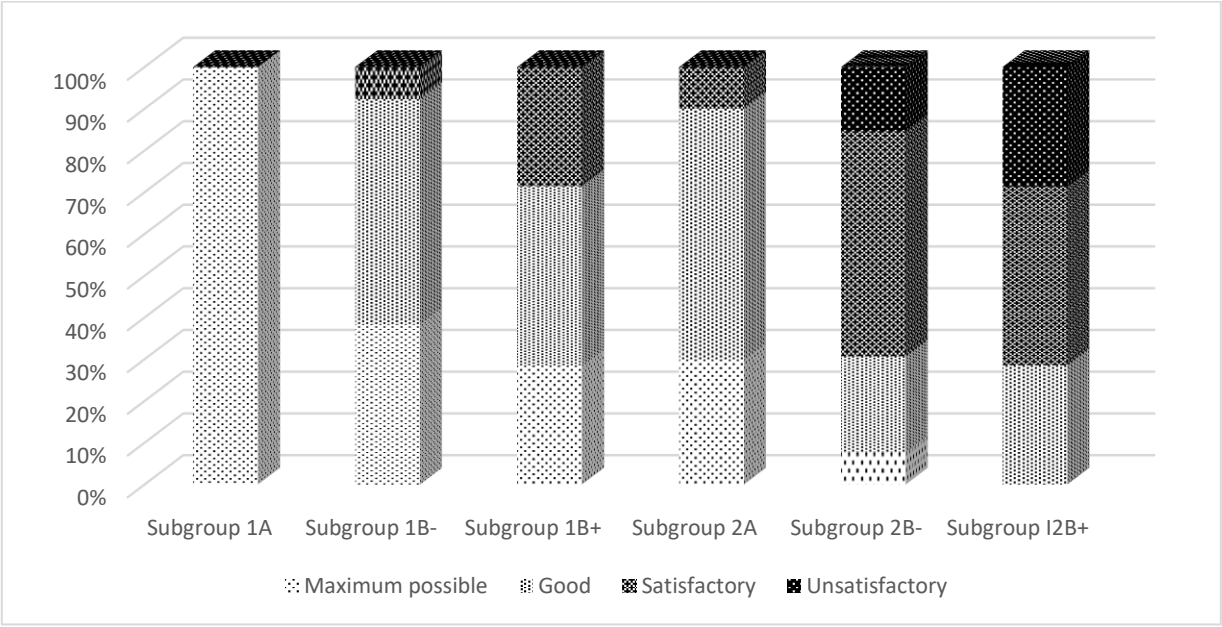
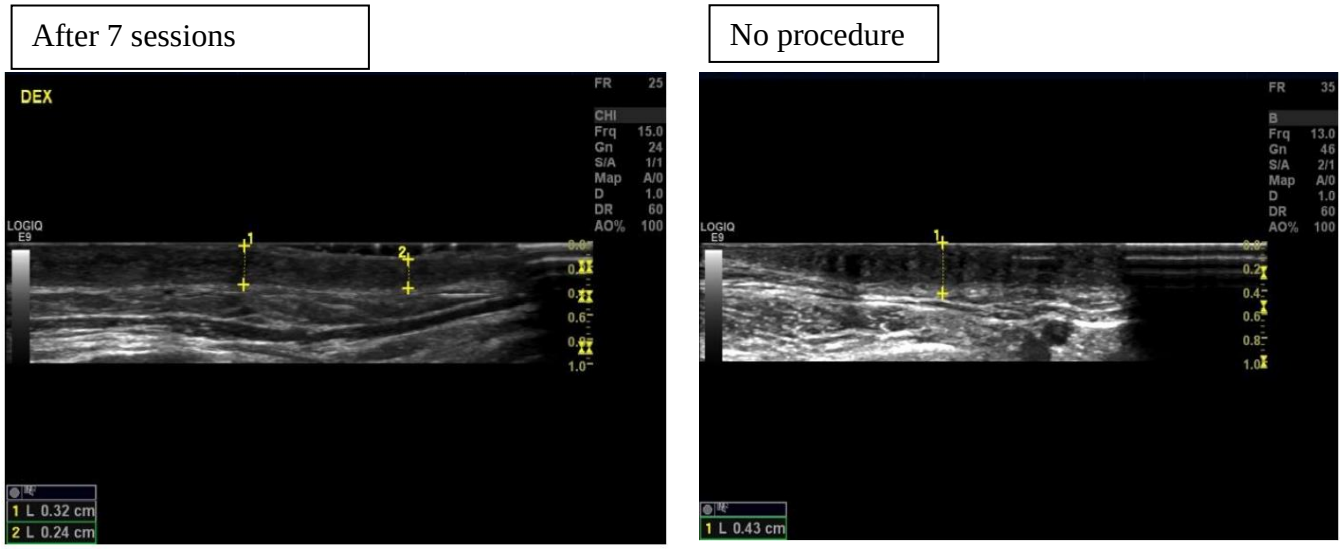


Figure 9.1. Subjective assessment by the patients of scar healing as per POSAS

When Multi Micro Alveolar Stimulation of postoperative wounds was included in the postpartum recovery programme, more rapid rates of scar healing by primary intention were noted, and the best criteria trends were evident: hyperaemia, puffiness, scar width, tenderness, sensation, and discomfort on palpation. The aesthetic effect presented in the photographs is better in the group that used icoone® Laser Med device than in the group of disciplined patients who received general recommendations for postoperative wound care and who used binders without the use of instrumental approaches. Scar tissue thickness, measured with a Samsung-HS40 ultrasound system, in the group of patients who received Multi Micro Alveolar Stimulation was reliably lower than in the control group (Figures 10-16).



Subgroup 1 B after 7 sessions **Subgroup 2 B without sessions**

Figure 10. Comparison of scar tissue thickness on the 17th day of the study among patients of the B subgroups

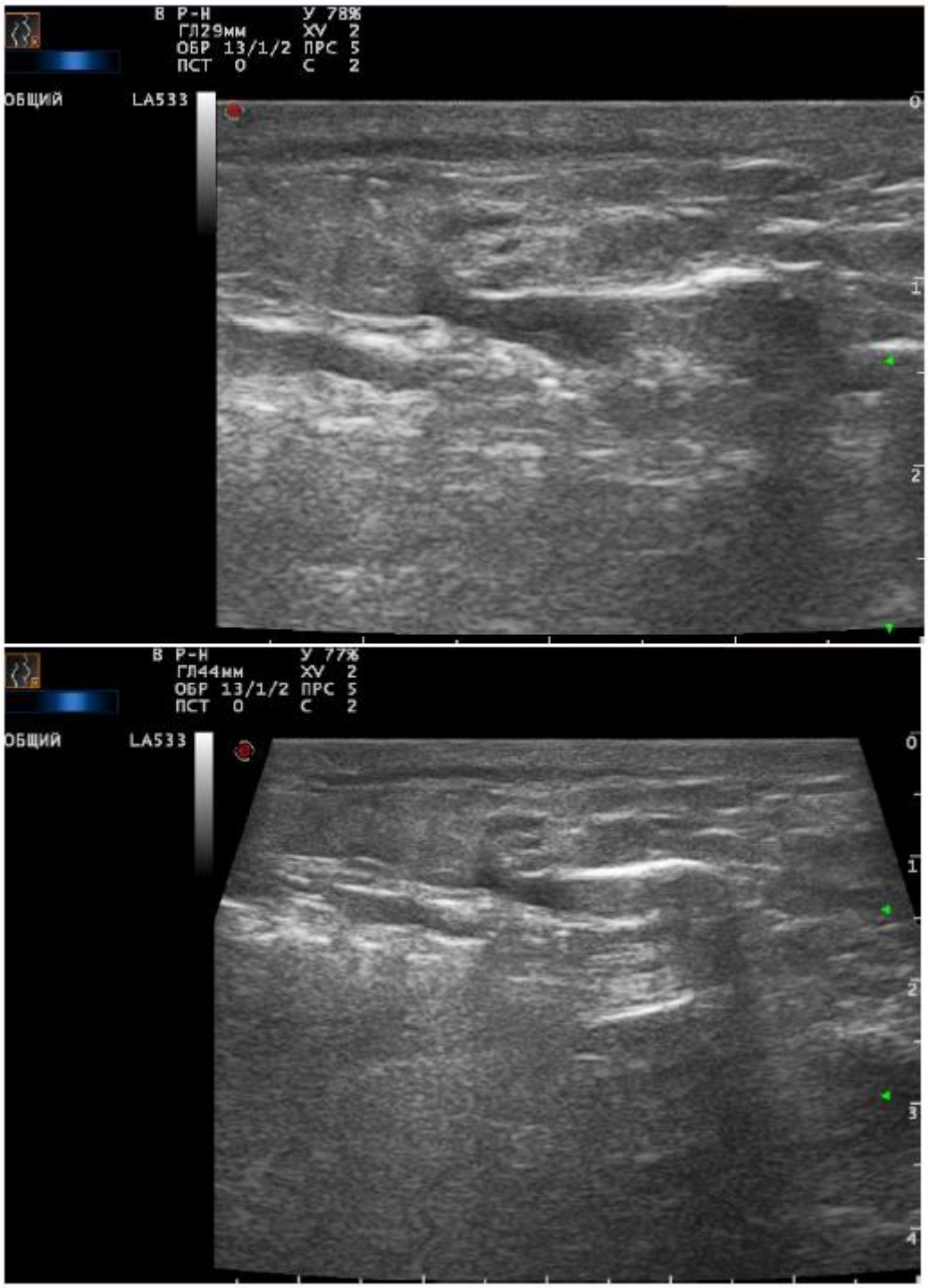


Figure 11. Patient A – 7 days after operation

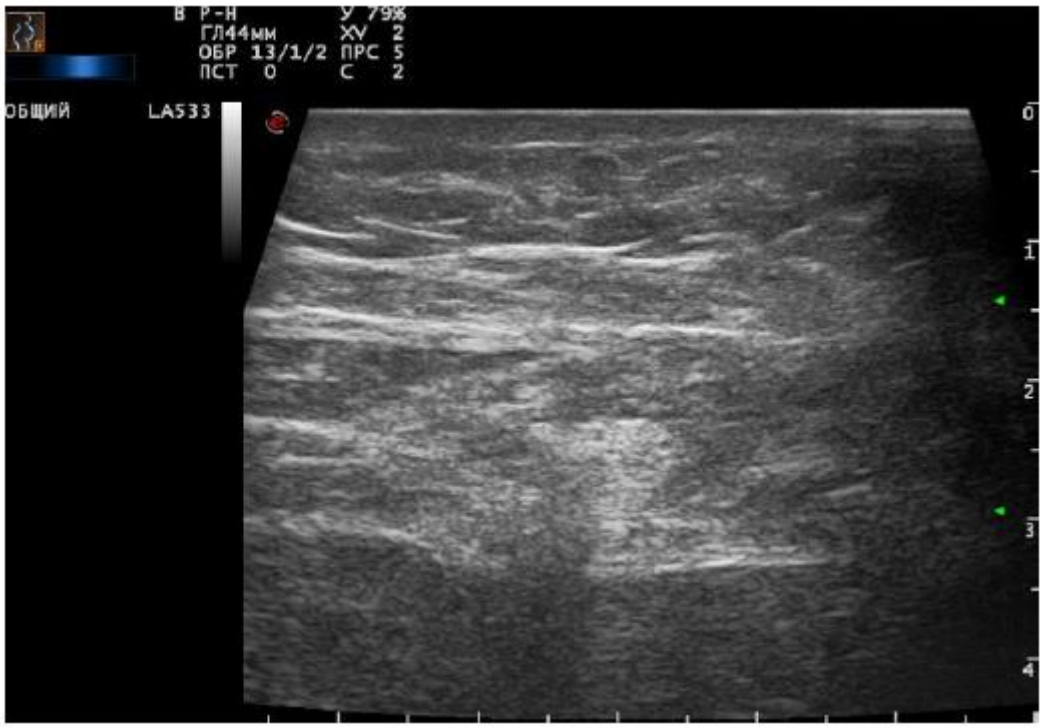


Figure 12. Patient A – 23 days after operation (after 7 sessions using the icoone® Laser Med device)

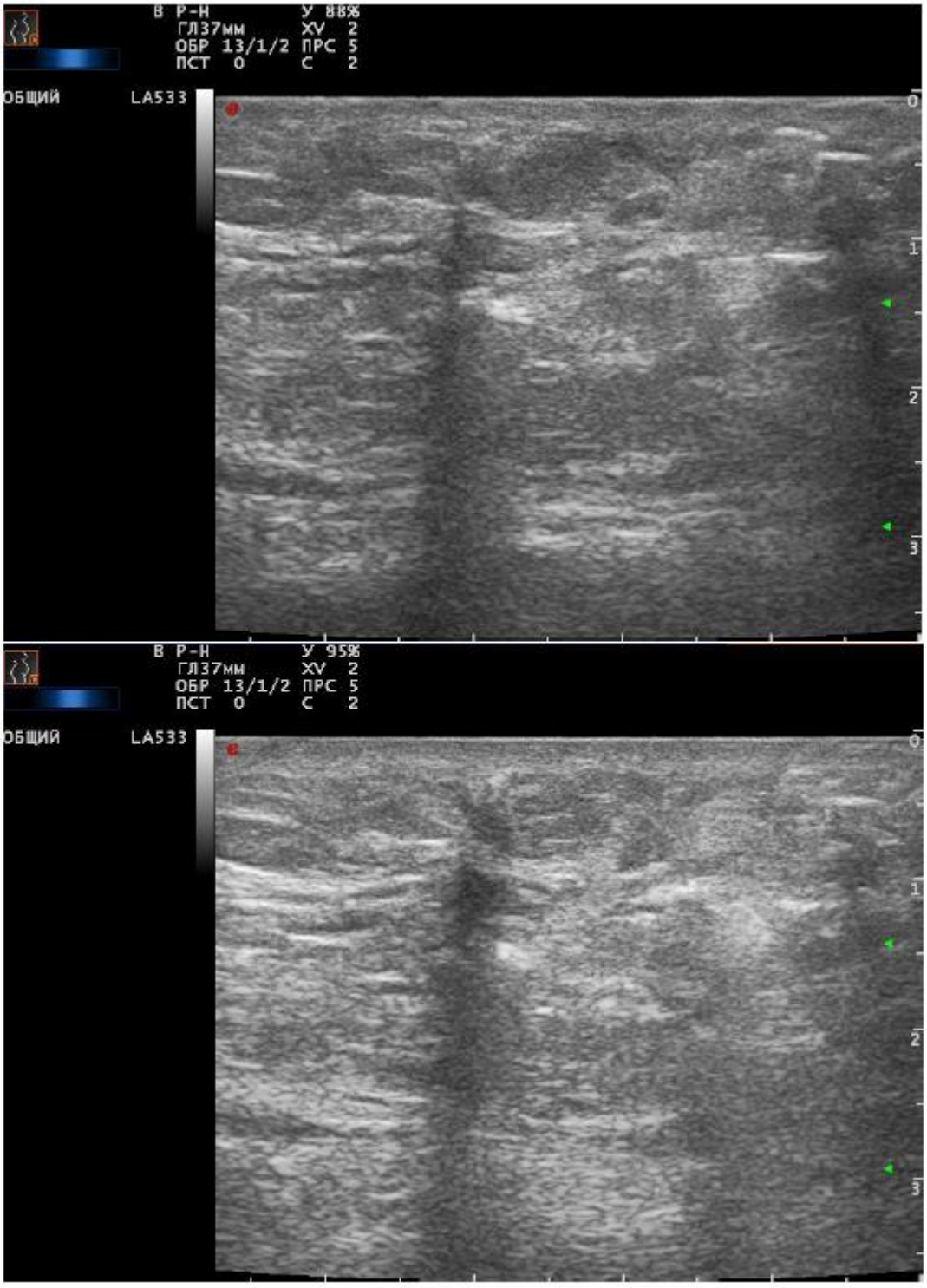


Figure 13. Patient B – 7 days after operation

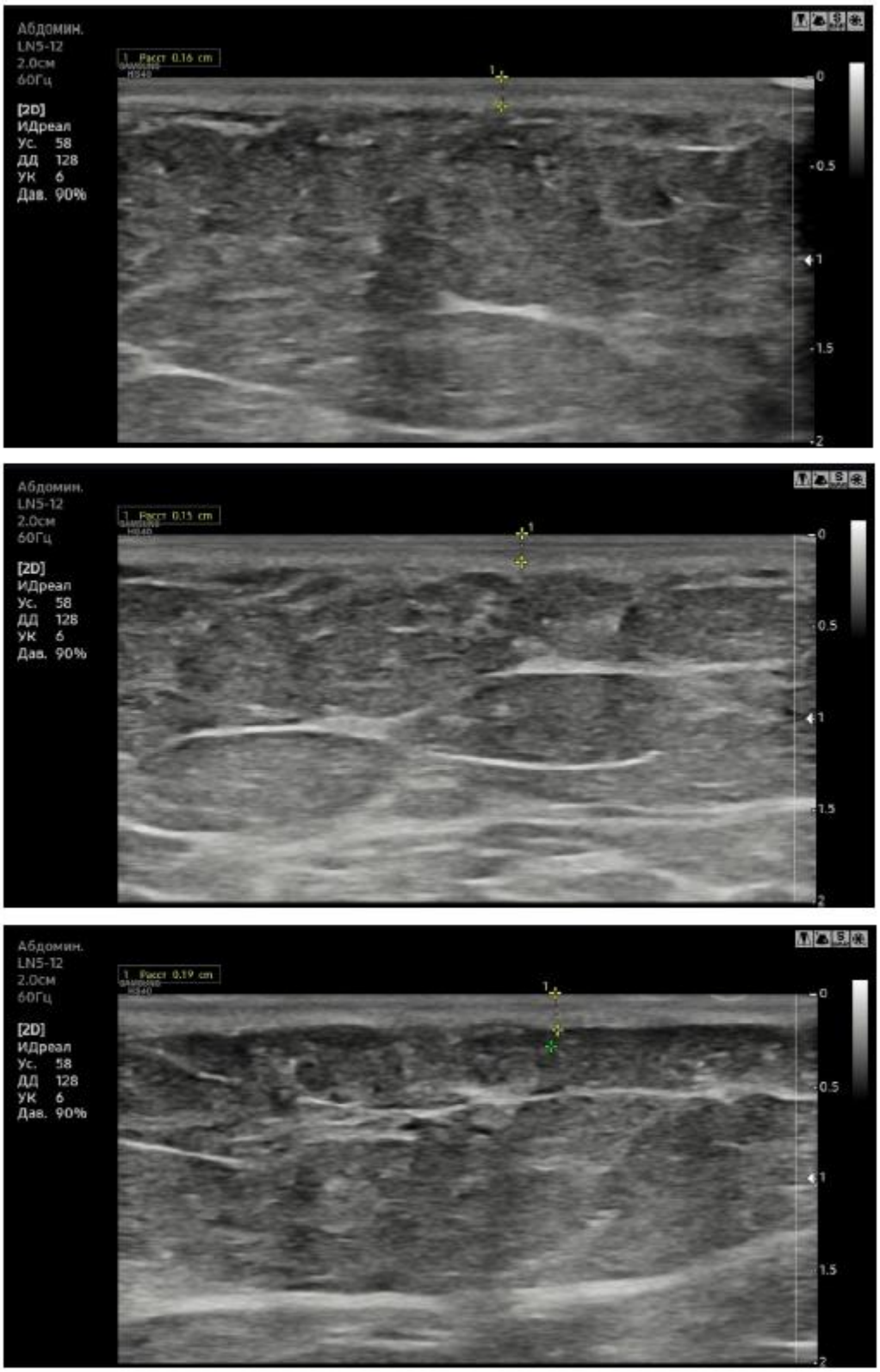


Figure 14. Patient B – 23 days (after 7 sessions with icoone® Laser Med device)

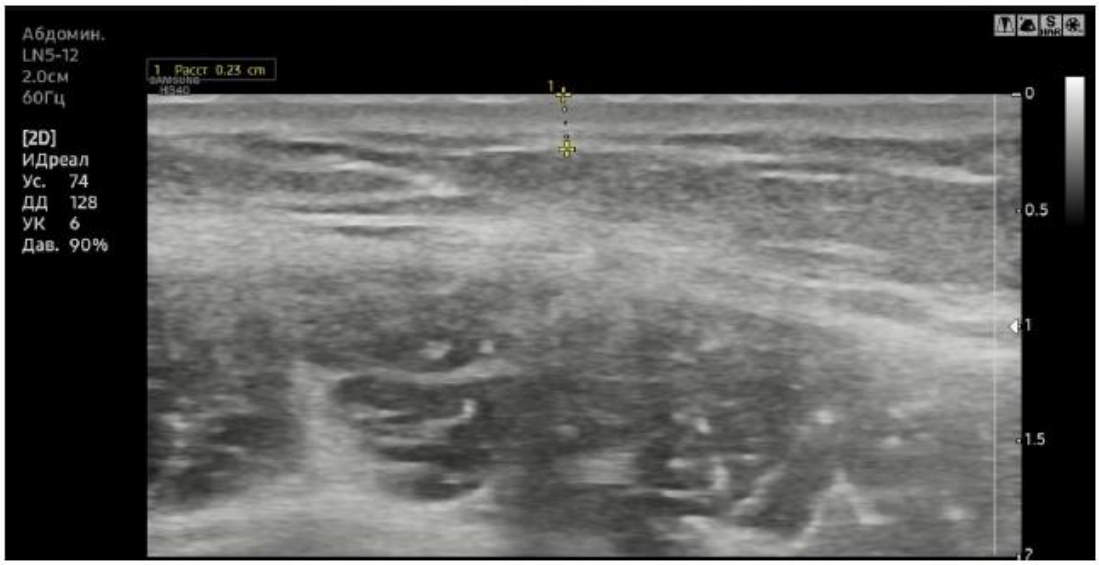


Figure 15. Patient C – 7 days after operation

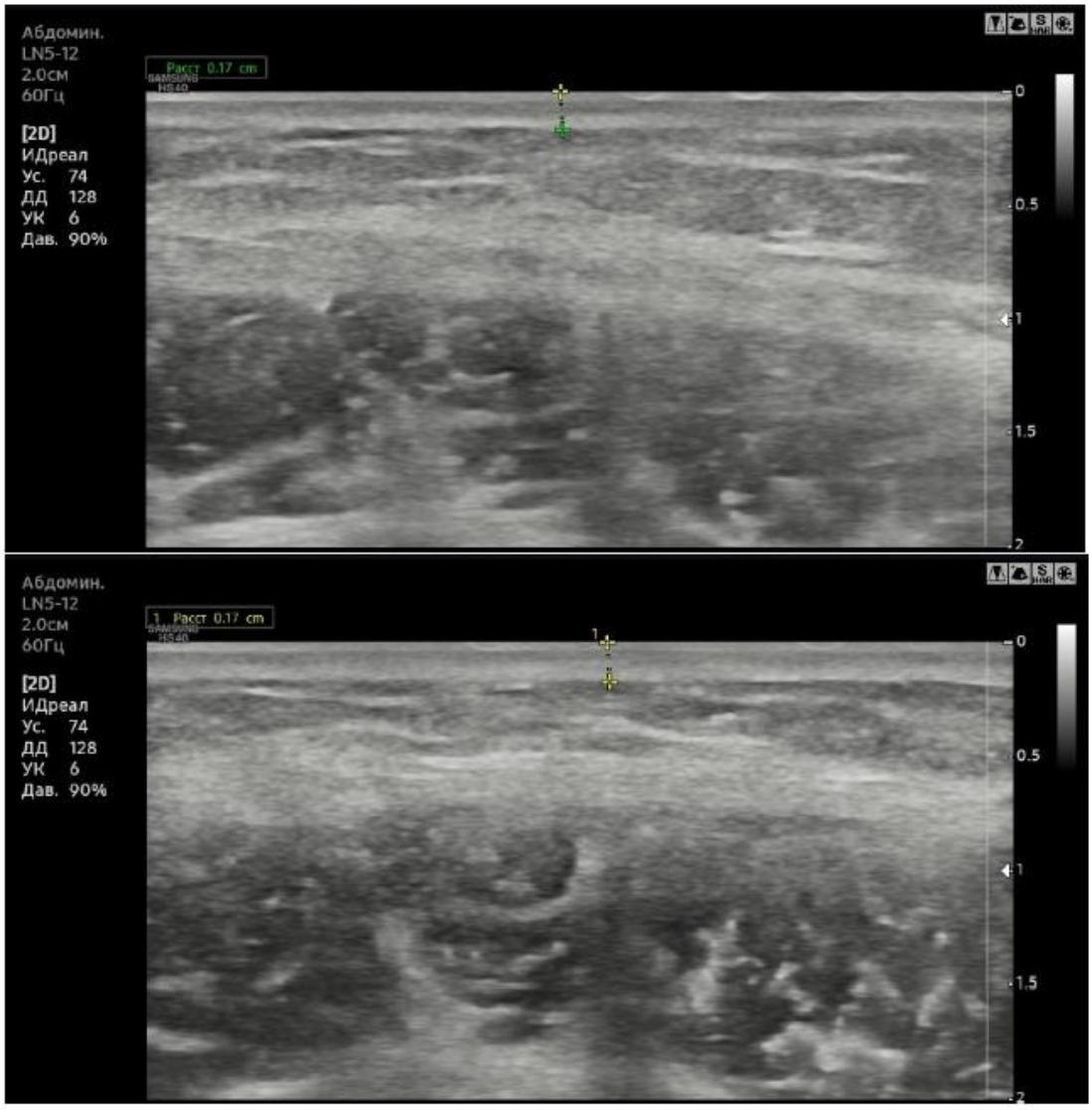
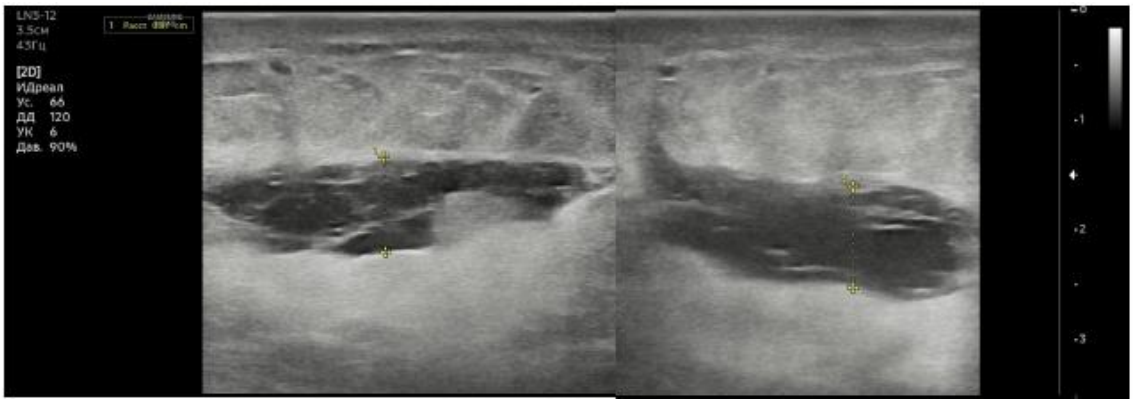


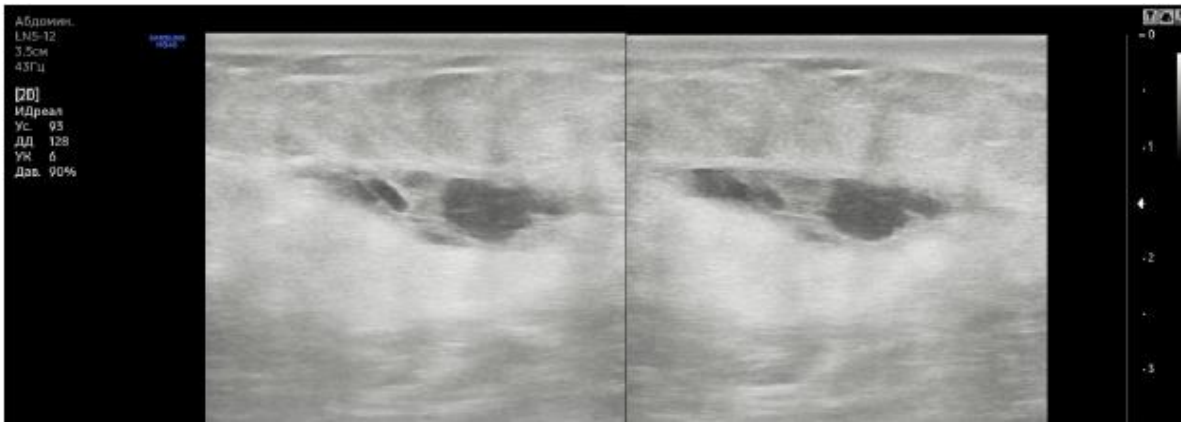
Figure 16 – Patient C – 23 days after operation (after 7 sessions with icoone® Laser Med device)

Below there is an example of the efficacy of using icoone® Laser Med device when there are postoperative haematomas (Figure 17)

Postoperative haematomas- after surgery



After 3 sessions



After 7 sessions

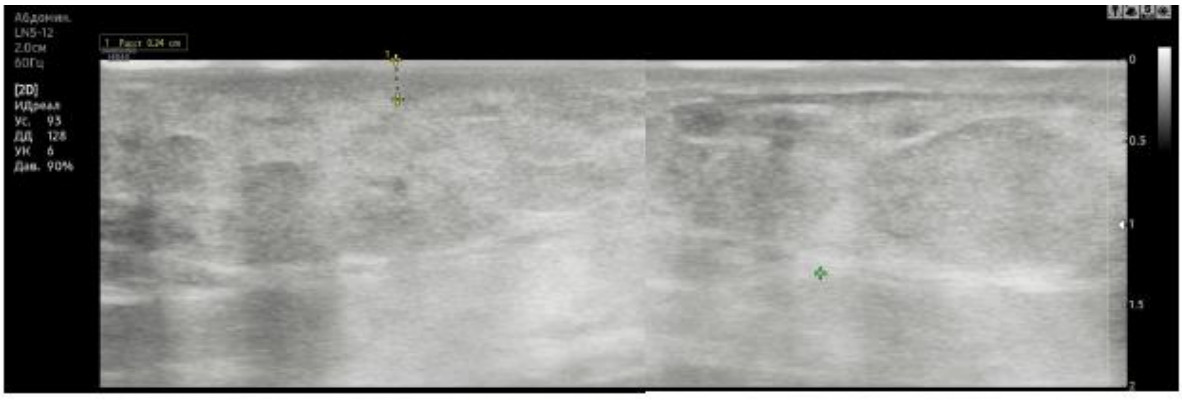


Figure 17. Effect of a course of icoone® Laser Med sessions with super aponeurotic haematoma.

Postoperatively the patient reported a haematoma, and the icoone® Laser Med procedure allowed for an excellent result.
Moreover, the results confirmed the best healing of postoperative wounds absent obesity and metabolic disorders in women, which conforms with known data from the literature.
Improvement in the data trends for healing even in this category of patients, albeit significantly more conspicuous than without the use of physiotherapy, is grounds for prescribing Multi Micro Alveolar Stimulation to patients with excess body mass and gestational diabetes after delivery.
In patients from subgroup 1B, who took part in the study protocol to assess the efficacy of the icoone® Laser Med device approach, there was also a body remodelling effect in the process of losing weight.
In the long term, for future studies there is interest in assessing the effect of Multi Micro Alveolar Stimulation using the icoone® device for lysis of postoperative haematomas. Such studies would require a larger number of patients.

Conclusion

Clinical testing of the innovative icoone® Laser Med device showed high efficacy, safety, and no side effects in the course of carrying out the recovery post C-section protocol. The benefit, as demonstrated in the study, of using Multi Micro Alveolar Stimulation in a postpartum recovery programme after operative delivery, provides justifiable grounds for the icoone® Laser Med procedure to be recommended after Caesarean section to patients who wish to hasten the regeneration of the postoperative wound and who seek a good aesthetic effect, as well as to women who have risk factors for poor postoperative wound healing: excess body mass, obesity, or carbohydrate metabolism disorders.
icoone® Laser Med technology is also recommended for treatment of postoperative haematomas by means of Multi Micro Alveolar Stimulation due to the enhanced lymphatic drainage and accelerated lysis.
During the use of the icoone® Laser Med medical device, no side effects were noted such as tenderness or discomfort; in fact, patients noted a high degree of satisfaction from undergoing the procedures.

Annex 1.

POSAS											
Physician's assessment											
Parameter	Score in points from 1 (resembles normal skin) to 10 (maximum severity)										**Notes**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Vascularisation											**Normal, pink, red, florid, mixed colours**
Pigmentation											**Hypopigmentation, hyperpigmentation, mixed**
Thickness											**Thicker, thinner than surrounding skin**
Surface relief											**Higher, lower than surrounding skin, mixed**
Elasticity											**Soft, hard, mixed**
Scar area as compared to the original wound											**Expansion, contraction, mixed**
Overall assessment of scar appearance*											
Patient's assessment											
No discomfort	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Maximum discomfort**
Tenderness											
Itching											
Looks like normal skin	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Very different**
Colour											
Denseness											
Thickness											
Surface relief											
Overall assessment of scar appearance*											
*** Not counted in overall score.**											

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Seal and signature