

Literature review of treatments and parameters for implementation of 9-tip radiofrequency microneedling device

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Background

- Radiofrequency (RF) microneedling is a popular technique to treat dermal tissue without significantly damaging the epidermis.
- This study is a review of the available literature comparing the capabilities of RF microneedling devices to a new device with 9 different tips.

Method

- A Pubmed and RightFind search was conducted using the key words “radiofrequency”, “RF”, and “microneedle”. Results were further condensed using the key words “multi-needle” and “FDA cleared”.
- Parameters were compiled and compared to one another to better understand the range of treatment options and settings available for use in the US market.

Results

- 32 articles discussing five FDA cleared devices resulted from the search which included parameters and device applications (Table 1).

Table 1. Summary of parameters found in peer reviewed literature	
Depths	0.5mm-3.5mm
Power	0-70W
Exposure Time (Pulse Width)	20ms-1,000ms
Frequency	1MHz and 2Mhz
RF Delivery System	Monopolar and Bipolar

- Common clinical conditions for these devices included improvement of blemishes, skin tightening (via soft-tissue coagulation) and skin revitalization.
- Devices had either insulated or non-insulated needles which affect the delivery of the RF energy.
- Treatment depths vary from 0.5mm to 3.5mm and exposure times range from 20ms to 1,000ms.

- All devices were able to deliver energy as low as 0W and as high as 70W. Higher energies are required to coagulate tissue which is integral for most indications.
- Available devices had either monopolar or bipolar delivery systems, which can affect how the energy and subsequent heat is delivered to the tissue.
- Based on the research, it is determined that a new device that offers a wide range of parameters and characteristics is necessary to treat all desired indications (Table 3).

Table 2. Summary of device characteristics found in peer reviewed literature

# of Needles	Needle Depth	Power	Pulse Width	RF Delivery	Frequency	Energy Delivered per Pin (mJ/pin, max)
7x7=49	0.5 - 3.5mm	0, 3-50W	10-1000ms	NR	NR	1020
7x7=49, 4x4=16	Up to 3.5mm	Max 50W	10-1000ms	Bipolar	NR	3214, 1020
1, 3	Up to 1.5mm	Max 46W	100-120ms	Monopolar	1 and 2Mhz	5520, 1840
36	0.5-3.5mm	30W-70W	100-800ms	NR	NR	1556
7x7=49	0.5-2mm	Max 60 W	30-100ms	NR	NR	122
25, 64	0.5-3.5mm	Max 25W	50-950ms	Bipolar	NR	950,371

Note. NR = none reported

Table 3. Characteristics of a new device to treat all desired indications

# of Needles	Needle Type	Needle Depth	Power	Pulse Width	RF Delivery	Frequency	Energy Delivered per Pin (max)
1,16,25,49	Semi-insulated, Insulated	0.5-4.0mm	Up to 50W	10-990ms	Monopolar, Bipolar	1 and 2MHz	49490,3093, 1980, 1010

Conclusion

- The literature concluded needle type, treatment depth, treatment density, monopolar versus bipolar energy delivery, total energy per pin and power are important when creating a customized treatment with RF microneedling.
- While RF microneedling is being used for a wide array of conditions, the exact parameters to treat each indication are just as wide. Further research is needed to define precise treatment parameters and protocols that will yield the optimal results while mitigating adverse events.