Interfaz biológica en TPN como mejora del tratamiento de heridas

Según los resultados de la observación del estudio de caso clínico presentado, parece que la adhesión de una capa biológica bajo un tratamiento de presión negativa funcionó sinérgicamente para estimular la fibroplasia, el desbridamiento autolítico y equilibrar el bioma para acelerar el cierre de la herida.

Me enorgullece compartir el póster "Interfaz biológica en NPWT como mejora del tratamiento de heridas" presentado en WUWHS 2022.

Gracias a Kathleen Leake por su conocimiento, su apoyo y su amabilidad.

BIOLOGICAL INTERFACE ON NPWT AS WOUND TREATMENT IMPROVEMENT

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BACKGROUND

In simple terms, NPWT refers to any device that seals the wound creating a near airtight environment. It is connected to a vacuum source that generates and maintains a hypobaric treatment atmosphere that stimulates cicatrization [1]
Application of a vacuum on a wound accelerates the growth healing tissue and vessels, and promotes border contraction. In addition to isolating the exterior injury, the vacuum maintains an environment of ideal moisture and temperature. Four main mechanisms are accepted as the variables for this clinical advantage. Although there are discrepancies between the physical mechanisms of action of NPWT, the clinical results and therapeutic benefits are clear in daily practice.
Hemicellulose dressing is a vegetal membrane that is derived from natural plant ingredients which contain vitamins, pro healing factors (vitamins, Usnic acid, Acetic acid, Lactic acid, Chatequins, Betaglucan, Polysachariides) and fibres of nanometric length[2]
NPWT application does present some limitations regarding wound bed properties as presence of devitalized tissue. Limitations regarding extending time up to 5 days between dressing changes are: fluid accumulation, odor, tissue tear and pain during dressing removal.

AIM

To set up a dynamic treatment environment, that promotes wound healing and adequate exudate management. Combining physical benefits from NPWT with pro healing factors and scaffold action of Hemicellulose dressing in order to accelerate wound healing and decrease cost of application, and also decrease dressing change rate, and human and material resources. This method also requires a presence of more than 50% of devitalized tissue.

METHOD

Dynamic treatment area where the wound bed interacts with natural substances, under a vacuum ambient with fluid removal. Dressing changes were performed at institutions or patient homes according to the patient needs and resources.

Biological contact layer and gel, was applied on the wound bed. Vegetal dressing was fenestrated or applied on slices to allow an adequate fluid removal and matrix integration.

NPWT was coupled on top. Gel was impregnated on the foam prior to the vacuum application.

CASE SERIES

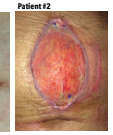
15 wounds of different origins were treated: Surgical dehiscence 6 wound (5 patients), Loss of substance (LOS) secondary to soft parts infection: 7 wounds (5 patients) and Acute trauma: 2 wounds (2 patients). Patients # 3,6,7 9,10 are diabetic. The resolution of the wound was programmed in two steps: first step with NPWT until the conditions were adequate to close the gap with a skin graft or rotate into AWC.

Patient #1

Day 0
September 30

Day 24
October 24

Patient #2



Day 0
July 18

Day 28
August 26

Patient #3

Day 0
October 9

Day 43
November 22

Patient #4

Day 0
October 25

Day 20
November 14

Patient #5

Day 0
December 16

Day 14
December 30

Patient #6

Day 0
October 9

Day 34
November 12

Patient #7

Day 0
September 6

Day 17
September 24

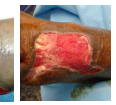
Patient #8

Day 0
May 15

Day 28
July 13

Patient #9

Day 0
July 18



Day 19
August 6

Patient #11

Day 0
October 1

Day 21
October 22

Patient	Sex	Age	Pathology	Localization	Wound Measurements (prior therapy)	Wound Measurements (after therapy)	Size Reduction	Tissue (Beginning)	Tissue (End)	NPWT treatment time	Dressing changes
1	Male	77 Years old	Surgical dehiscense	Abdomen	Width 2,5 Cm / Length 5,4 Cm / Deepth >2,5 Cm	Width 0,8 Cm / Length 5,4 Cm / Deepth 1 Cm	50 Cm3 - 4 Cm3= 92%	Slough 85%	Granulation 100%	24 Days	5
2	Male	64 Years old	Surgical dehiscense	Abdomen	Width 6 Cm / Length 11,5 Cm / Deepth <1 Cm	Width 4 Cm / Length 9 Cm / Deepth <1 Cm	69 Cm3 - 36 Cm3= 48%	Atrophic granulation 100%	Granulation 100%	28 Days	5
3	Female	65 Years old	Surgical dehiscense	Pubis	Width 6 Cm / Length 4,5 Cm / Deepth <0,5 Cm	Width 2,5 Cm / Length 2 Cm / Deepth <0,5 Cm	27 Cm2 - 5 cm2= 82%	Slough75%	Granulation 100%	43 Days	8
	Female	65 Years old	Surgical dehiscense	Abdomen	Width 2,5 Cm / Length 10 Cm / Deepth 1 Cm	Width 0,5 Cm / Length 2,5 Cm / Deepth 0,5 Cm	75 Cm3 - 0,85 Cm3 = 98%	Granulation 0%	Granulation 100%	43 Days	8
4	Male	57 Years old	Surgical dehiscense	Sternal	Width 4 Cm / Length 12 Cm / Deepth >1,5 Cm	Width 1,5 Cm / Length 11,5 Cm / Deepth 0,5 Cm	72 Cm3 - 8, 6 Cm3 = 88%	Fibrine 45%	Granulation 100%	21 Days	4
5	Male	4 Years old	Surgical dehiscense	Abdomen	Width 10 Cm / Length 17 Cm / Deepth 1 Cm	Width 8 Cm / Length 12,5 Cm / Deepth <1 Cm	170 Cm3 - 100 Cm3= 41,7%	Slough 95%	Granulation 100%	14 Days	3
6	Male	59 Years old	LOS	Groin	Width 4 Cm / Length 12 Cm / Deepth >6 Cm	Width 0,4 Cm / Length 5 Cm / Deepth NO	288 Cm3- 2 Cm2= 99%	Granulation 0%	Granulation 100%	34 Days	7
7	Male	55 Years old	LOS	Pubis	Width 2 Cm / Length 5,5 Cm / Deepth 2 Cm	Width 0,5 Cm / Length 3 Cm / Deepth 0,5 Cm	22 Cm3-0,75 Cm3= 96%	Granulation 0%	Granulation 100%	21 Days	4
	Male	55 Years old	LOS	Testicle	Width 4 Cm / Length 6 Cm / Deepth 1 Cm	Width 3 Cm / Length 4 Cm / Deepth <0,5 Cm	24 Cm3-0,6 Cm3= 97,5%	Granulation 0%	Granulation 40%	5 Days	1
8	Male	22 Years old	LOS	Left toe	Width 0,8 Cm / Length 3,5 Cm / Deepth 1 Cm	Width 0,2 Cm / Length 0,5 Cm / Deepth NO	2,8 Cm3- 0,1 Cm2= 96%	Bone exposition	Granulation 100%	35 Days	7
	Male	22 Years old	LOS	Right toe	Width 0,8 Cm / Length 3 Cm / Deepth >2 Cm	HEALED	100%	Bone exposition	Granulation 100%	28 Days	5
9	Male	39 Years old	LOS	Back of foot	Width 6 Cm / Length 8 Cm / Deepth 1 Cm	Width 1,5 Cm / Length 7 Cm / Deepth NO	48 Cm3 - 41 Cm2= 15%	Tendon exposition	Granulation 100%	19 Days	4
10	Male	52 Years old	LOS	Back of foot	Width 2,5 Cm / Length 4 Cm / Deepth >2 Cm	Width 0,5 Cm / Length 3,5 Cm / Deepth NO	20 Cm3- 1,75 Cm3= 91,2%	Slough 60%	Granulation 100%	35 Days	7
11	Male	13 Years old	Acute trauma	Back of foot	Width 2,8 Cm / Length 4 Cm / Deepth >2 Cm	Width 1,5 Cm / Length 2 Cm / Deepth NO	22,4 Cm3- 3 Cm3= 87%	Bone and tendon exposition	Joint covered 100%	21 Days	4
12	Male	36 Years old	Acute trauma	Neck and shoulder	Width 8 Cm / Length 17 Cm / Deepth >3 Cm	Width 7 Cm / Length 16 Cm / Deepth <2 Cm	408 Cm3 - 168 Cm3= 58%	Granulation 0%	Granulation 100%	14 Days	2

RESULTS

Dressing changes every 5 days allowed qualitative wound assessment and quantitative measurement to compare outcomes. According to the clinical findings, the results have shown properties that enhance and balance the biome in order to accelerate wound closure: Autolytic debridement, fibroplasia.
Fibroplasia: Accelerate tissue regeneration and vascularization. All the wounds had a satisfactory response with growth of granulation tissue to fill the loss of substance. Patients N^{0} 7,8,9 presented joint structures exposed. On all three patients, the coverage occurred after 3 weeks of application.
Autolytic debridement: Patients # 1,3,4,5 and 10 present more than 50% of non viable tissues prior to the beginning of treatment. After the first dressing change there was evidence of decreased adhesion of non-viable tissues to the wound bed. Devitalized tissues as fibrine or necrotic material is easily removed with a hand clip during dressings change.
The application of a biological contact layer allowed for the maintenance of the same dressing for up to 5 days avoiding pain and bleeding during dressings change. No leak or loss of vacuum occurred. No patient reported inconveniences or allergies.
All the wounds evolved positively, allowing to simplify the the approach and rotate to AWC. Patient #9 required a skin graft to close the gap.

CONCLUSION

Based on the results from the presented clinical case study observation, it appears that the adhesion of a biological layer under a negative pressure treatment worked synergistically to stimulate fibroplasia, autolytic debridement and balance the biome in order to accelerate wound closure.
Every time the wound bed is exposed to the exterior, a latency period takes place, slowing healing until the ambient conditions are adequate again. The vegetal layer does not interfere with the fluid removal, allowing for extended time between dressings changes. This is a benefit of the system (reduced human and material resources) and also for the patient, providing more comfort.
Provide a more efficient atmosphere of treatment that overcomes the limitations and results of NPWT alone. Better results will decrease the total time of use, improving the way that we use this tool.

REFERENCES

[1] Panayi AC, Leavitt T, Orgill DP. Evidence based review of negative pressure wound therapy. *World J Dermatol* 2017; 6(1): 1-16.
[2] N. Lin, A. Dufresne / European Polymer Journal 59 (2014) 302–325.

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