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Parallel Relaxing Incisions for High-Tension Wound Closure: A Case Series on the Leg

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Introduction

For nearly two centuries, dermatologic surgeons have relied on anatomical skin tension maps—most notably Langer's lines [1], Borges' relaxed skin tension lines (RSTLs) [2], and Kraissl's wrinkle lines [3] to guide excision planning. While historically significant, these systems were derived from cadaveric or static observations and do not fully account for the dynamic biomechanical forces encountered during excisional surgery. In contrast, Biodynamic Excisional Skin Tension (BEST) lines, introduced by Paul [4,5], offer a modern paradigm based on real-time intraoperative tension mapping in living patients. BEST lines run vertically along the limb axis and reflect the natural orientation of tension vectors under dynamic conditions, representing the direction of least wound closure tension. Aligning excisions with BEST lines optimises wound edge stability and reduces closure strain, particularly in high-tension regions such as the anterior leg.

Despite BEST line alignment, closure can remain challenging due to persistent peak tension. To address this, Paul [4,5] introduced "parallel relaxing incisions" a technique involving vertical incisions placed adjacent to the primary defect to redistribute mechanical forces and reduce peak tension (T□□□) along the central closure line. This approach is especially beneficial in areas with limited skin mobility, where standard elliptical excisions may elevate wound tension and compromise closure integrity.

Case Series

This case series evaluates the clinical application of parallel relaxing incisions in twenty patients (mean age 73.6) with squamous cell carcinoma lesions on the anterolateral or distal leg (Table 1). Patients were selected due to their unsuitability for primary closure. Following excision of the lesion, vertical parallel relaxing incisions were employed. Wounds were closed in layers with 3.0 or 4.0 Monocryl (Ethicon), and wounds were dressed with non-adherent materials like Interpose (Multigate) and LogiFix Tan

(Medilogic); then they were monitored for at least 2 weeks, further if needed.

Healing times ranged from 2 to 10 weeks. Four cases exhibited early dehiscence due to non-compliance with post-operative care, with three out of four infections successfully treated with antibiotics. All wounds eventually heal by secondary intention. Cosmetic outcomes were favourable, with linear scars and minimal tissue distortion. Pain was mild and managed with paracetamol. Most patients adhered to post-operative protocols, including rest and limb elevation, contributing to successful outcomes.

Cases involving the shin and anterior leg are illustrated in Figures 1 and 2, respectively.

Conclusion

This case series demonstrates the utility of parallel relaxing incisions in managing cutaneous lesions in high skin tension anatomical regions where primary closure is not feasible. Aligning the original elliptical excision along biodynamic excisional skin tension (BEST) lines allows one to make vertical parallel relaxing incisions to further reduce wound tension. This allows for primary closure and avoids the need for skin grafts or complex flaps.

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Figure 1. From Top left to bottom right: Lesion itself, preoperative marking, immediate post-operation, two weeks post-op.

Figure 2. Anterior leg SCC with tension-guided excision. From top left to bottom right: surgical design, immediately post-operation, two weeks post-operation, four weeks post-operation.

Table 1. Summary of patient outcomes following vertical release incisions.

	Age	Gender	Location	Type of Cancer	Complications	Healing Time	Smoking	Anticoagulation	Medications used
1	70	F	L lat leg	SCC	Nil	2 weeks	Yes	No	
2	48	M	L shin	SCC	Nil	2 weeks	No	No	
3	86	M	R lat leg	SCC	Minor bleeding	3 weeks	No	No	
4	78	F	R lat leg	SCC	Nil	2 weeks	No	No	
5	71	F	R distal leg	SCC	Nil	2 weeks	No	No	Paracetamol
6	61	M	L shin	SCC	Nil	2 weeks	No	No	
7	73	M	R distal leg	SCC	Nil	2 weeks	No	No	
8	74	F	L distal leg	SCC	Mild dehiscence	3 weeks	No	No	
9	81	F	R shin	SCC	Wet dressing/ Maceration & Infection	10 weeks	No	Yes	Paracetamol Cephalexin
10	68	M	L shin	SCC	Dehiscence	8 weeks	No	No	Paracetamol Cephalexin
11	70	M	R shin	SCC	Maceration	3 weeks	Yes	No	Paracetamol
12	72	M	L shin	SCC	Nil	2 weeks	No	Yes	
13	69	M	L lat leg	SCC	Nil	2 weeks	No	Yes	
14	82	F	L prox leg	SCC	Nil	2 weeks	No	No	Paracetamol
15	72	M	R dist leg	SCC	Dehiscence	4 weeks	No	No	
16	82	M	L calf	SCC	Nil	2 weeks	No	No	
17	54	M	L shin	SCC	Nil	2 weeks	Yes	No	

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