

RESEARCH ARTICLE

Converging *Pvt1* signaling and 3D bioprinting technology for next-generation biodegradable tracheal replacement constructs

Supplementary file

Table S1. Real-time quantitative polymerase chain reaction primer sequences

Gene	Primer sequence (5'-3')
<i>Pvt1</i>	Forward: 5'-CAGAGGTCCCCGAGTGGATA-3'
	Reverse: 5'-AAGAAAATCAGGCGGGAGGG-3'
<i>Dlk1</i>	Forward: 5'-AGCTCCCTCTATGCGCTCTA-3'
	Reverse: 5'-TGTCACACAGCAACACGAGA-3'
<i>Tnfa</i>	Forward: 5'-CCAGGCAGGTTCCGTCCCTC-3'
	Reverse: 5'-ACAGACACCGCCTGGAGTTC-3'
<i>Il6</i>	Forward: 5'-AGCTATGAAGTTTCTCTCCGC-3'
	Reverse: 5'-CTAGGTTTGCCGAGTAGACCTC-3'
<i>Gapdh</i>	Forward: 5'-GCATCTTCTTGTGCAGTGCC-3'
	Reverse: 5'-TACGGCCAAATCCGTTTACA-3'

Table S2. Methylation primer sequences

Gene	Primer sequence (5'-3')
<i>Dlk1-M</i>	Forward: TTAGTGGTTTTTGTGTTTATAGGC
	Reverse: AACAAACCTTAATACCTACTCCCG
<i>Dlk1-U</i>	Forward: AGTGGTTTTTGTGTTTATAGGTGG
	Reverse: ACAAACCTTAATACCTACTCCCAA

Abbreviations: M, methylated; U, unmethylated.

Table S3. Mechanical properties of the tracheal replacement scaffold

Three-point bending test	Polycaprolactone tracheal replacement scaffold
Displacement/Load	0.5 mm/N (average displacement per unit load)
Compressive strength	12 MPa
Force distribution	Uniform across scaffold; localized forces distributed effectively due to the scaffold structure
Rotation angle	5–15° under maximum load

Table S4. Clinical follow-up evaluation results of the three-dimensionally printed tracheal replacement scaffold for tracheal defect repair

Parameter	Polycaprolactone tracheal replacement scaffold
Tracheal composition	Three-layered polycaprolactone structure
Length/mm	10 mm
Airway obstruction	None observed in 90% of cases
Intravascular ultrasound examination of vascular stenosis	No significant stenosis detected (less than 10% narrowing)
Regenerated epithelium	85% coverage by 4 weeks
Regenerated vessels	Present, with capillary network formation observed
Regenerated cartilage	Partial formation (observed in 70% of cases)
Follow-up period	Four weeks