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Lumbar Intervertebral Disc Transplantation

Long-term *in vivo* kinematics in goats

Keith D.K. LUK [1], Yong-Can HUANG [1], Jun XIAO [2],
William W. LU [1], Victor Y.L. LEUNG [1]

[1] Department of Orthopaedics and Traumatology, The University of Hong Kong, Hong Kong SAR, China;
[2] Department of Joint Surgery, Nanfang Hospital, Southern Medical University, Guangzhou, China.

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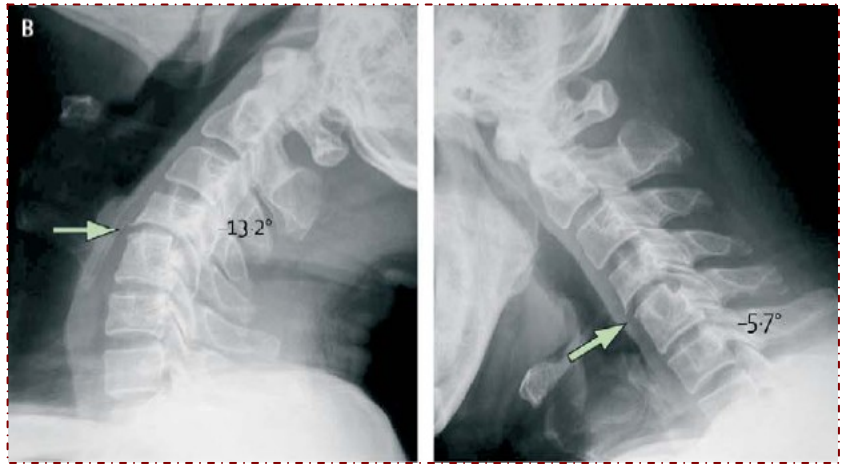
Introduction

1. Intervertebral disc allograft transplantation in human cervical spine can relieve neurological symptoms and restore the segmental kinematics.



2. Extending this technique to the lumbar spine remains a challenge because of the difference in anatomy and loading mechanics; whether the behavior of such transplant will be the same in the lumbar spine is still unknown.

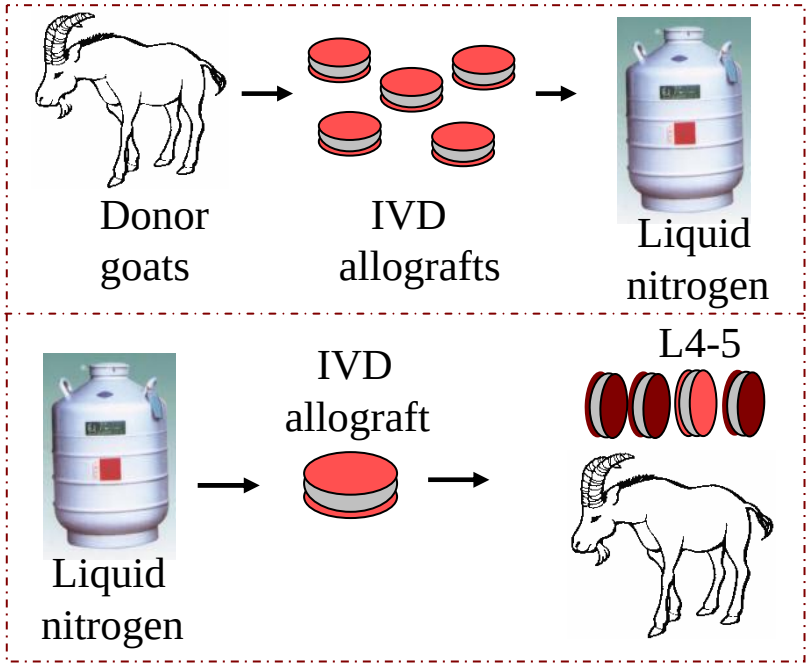
3. This study evaluated the long-term *in vivo* kinematics of the spinal segment following intervertebral disc transplantation in the goat lumbar spine model.

Ruan D, et.al. Lancet.2007; 369: 993-9.

Methods

Animals: 12 goats, 6-9m, male, 20-27.5kg

- 2 goats: disc allograft donor
- 5 goats: allograft recipient
- 5 goats: untreated control

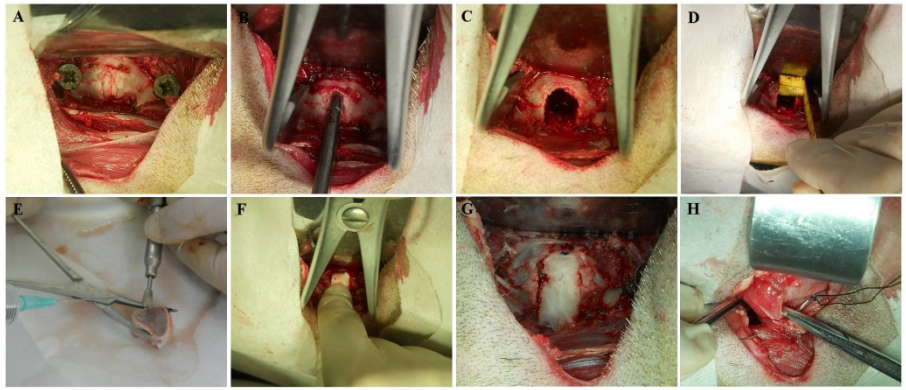


Schematic diagram for disc allograft preparation and transplantation

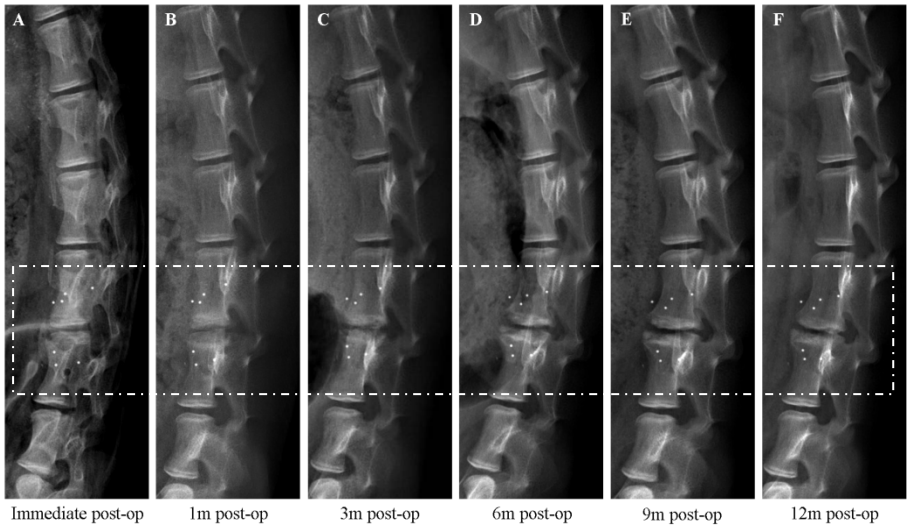
Steps:

1. Lumbar intervertebral disc allografts preparation and transplantation;
2. Lateral radiographs of the lumbar spine in the neutral, full flexion and full extension positions were taken at 1, 3, 6, 9 and 12 months post-op;
3. Disc height (DH) of the allograft and the adjacent levels were measured;
4. Range of motion (ROM) of the disc transplanted segment, the adjacent levels, and the global lumbar spine were measured using the Cobb's method. (kyphosis is denoted as +, and lordosis as -)

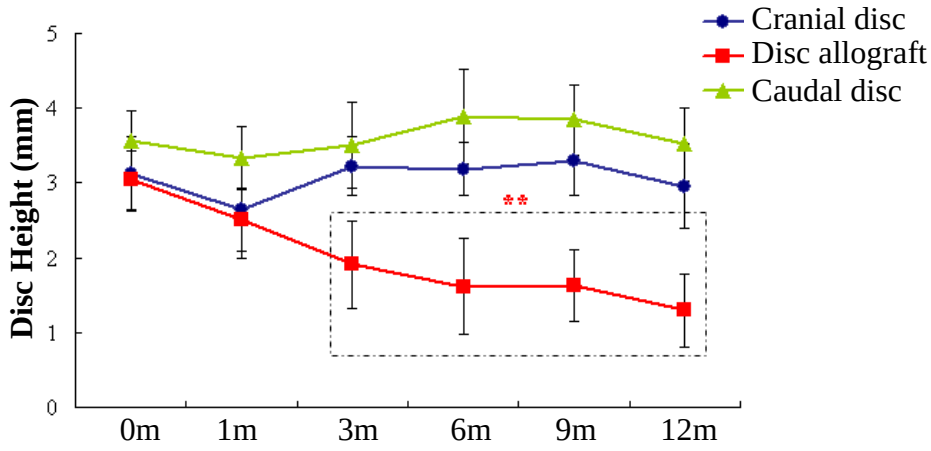
Results



Surgical techniques for disc transplantation



Serial follow-up radiographs post-transplantation



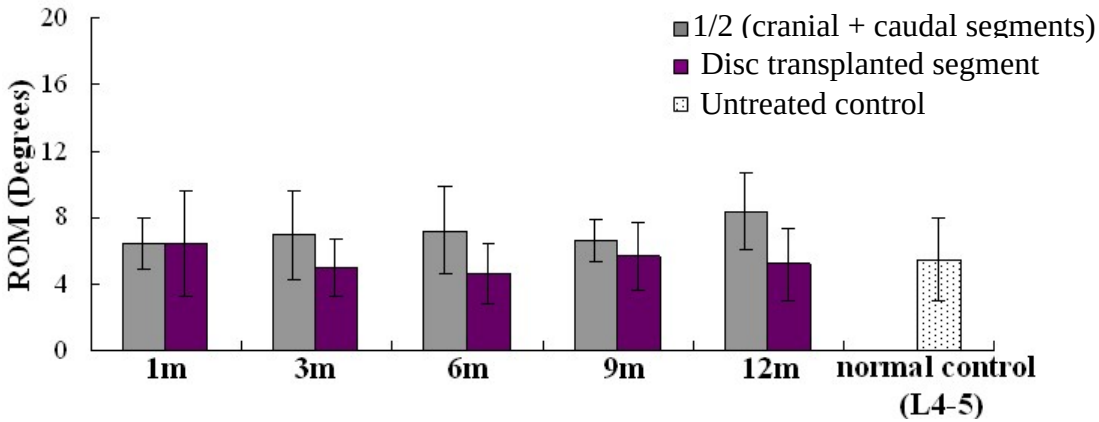
***P<0.01, DH_{0m} vs. $DH_{3, 6, 9 \text{ and } 12m}$*

1. All disc allografts were well seated and remained so throughout the follow up period;
2. Decreasing trend of DH continued up to the 3rd month post-op but stabilized thereafter without further reduction;
3. No significant change in DH of the adjacent levels was exhibited.

Segmental ROM (⁰)

	Range of motion		
	Cranial segment	DT-segment	Caudal segment
1m post-op	6.7	6.4	6.1
3m post-op	7.2	5.0	6.8
6m post-op	6.7	4.6	7.8
9m post-op	5.9	5.7	7.4
12m post-op	6.7	5.2	10.1
Range	(5.9, 7.2)	(4.6, 6.4)	(6.1, 10.1)

ROM at the cranial, the disc transplanted (DT) and the caudal segments.



Comparison of ROM (M ±SD) between the transplanted segment and the average ROM of the two adjacent segments and that of the untreated control; no significant difference was found (P>0.05).

1. There was no significant difference between the mean ROM of the transplanted disc and that of the two adjacent segments;

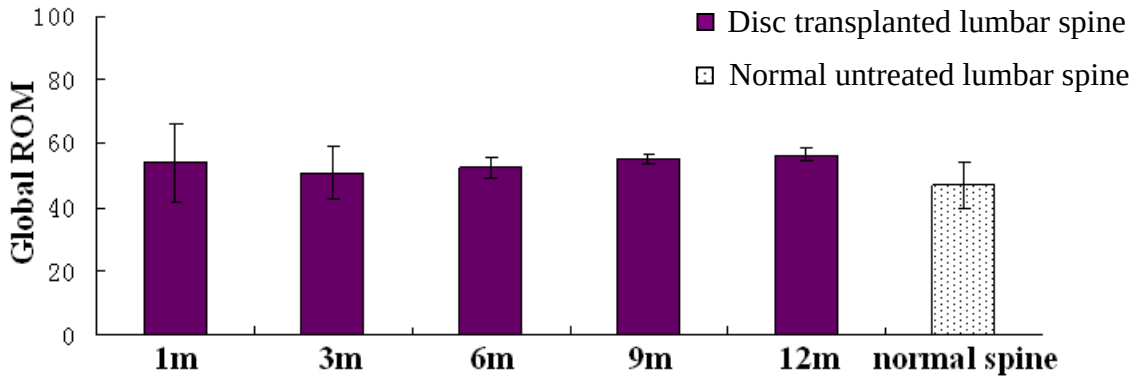
2. Mean ROM of the transplanted disc was comparable to that of the untreated L4-5 disc.

Global ROM (⁰)

	DT-lumbar spine	
	Flexion	Extension
1m post-op	+53.7	-0.3
3m post-op	+49.1	-1.8
6m post-op	+49.7	-2.7
9m post-op	+51.2	-4.0
12m post-op	+53.6	-3.0
Range	(+49.1, +53.7)	(-4.0, -0.3)

Global motion of the lumbar spine following disc transplantation (kyphosis is denoted as +, and lordosis as -)

The global ROM of the lumbar spine after intervertebral disc transplantation was well preserved when compared to that of the normal untreated goats.



Comparison of global lumbar ROM (M±SD) between the disc transplanted and the untreated spines; no significant difference was found (P>0.05)

Conclusions

1. Lumbar intervertebral disc transplantation without internal fixation can be successfully performed in goats.

2. Lumbar intervertebral disc transplantation could restore the global and segmental mobility after 12 months despite a mean reduction of the allograft height at the initial 3 months.

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Correspondence: Keith D.K. LUK, Department of Orthopaedics and Traumatology, The University of Hong Kong, 5/F Professor Block, Queen Mary Hospital, Pokfulam, Hong Kong. **E-mail:**hrmoldk@hku.hk