*Study Design/Patients and Methods:* Thirteen children with mediastinal lymphangiomas underwent thoracoscopy between 1995 and 2000. Four of the cases were already diagnosed before birth. Two to 3 trocars with a maximal diameter of 5 mm were placed. The Nd:YAG 1064 nm laser is extremely helpful in infants and small children. The small flexible laser fiber can be introduced into the intercostal space via a 14-gauge puncture cannula. Safe resection can be achieved by the fibertome mode.

*Results:* Representative tissue samples were obtained in all cases. There were no intraoperative complications. In one boy with a simple cystic lymphangioma and intraspinal involvement only the mediastinal portion could be extirpated. Thorax suction drainages were removed after 1-3 days. Patients were discharged after 2-7 days. We found no lymphatic fistulas after excision of the lymphangioma. Two years after surgery, a central lymphatic cyst was detected as a late complication.

*Conclusion:* Video-assisted thoracoscopic surgery is recommended as „first line" treatment in mediastinal lymphangiomas.

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## OPTICAL COHERENCE REFLECTANCE GUIDED PERCUTANEOUS TRANSMYOCARDIAL LASER REVASCULARIZTION

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Creating laser channels percutaneously for transmyocardial laser revascularization (TMR) has been limited to shallow channels due to fear of LV perforation and tamponade. Limited channel depth may limit the clinical benefit compared to transmyocardial TMR channels. We evaluated Optical Coherence Reflectometry (OCR) as a simple, inexpensive means of real-time assessment of laser ablated channel depth and proximity to the epicardium. An Intraluminal Therapeutics (ILT) OCR system used a low coherence LED at 1310 nm (+30/-50 nm) to generate reflectance signals at tissue interfaces. The ILT OCR system was used to examine endocardium, intra-myocardium, and epicardial signals *in vitro* using fresh porcine hearts under saline. Reflection spectra for endocardium, intra-myocardial and epicardial signals were easily differentiated. The OCR system was then used to guide percutaneous TMR (PTMR) in 60kg anesthetized swine with a 308 nm excimer laser (Spectronetics) delivering light via a 1.7 mm laser catheter emitting 50 mJ pulses at 25 Hz. The OCR fiber was placed in the central lumen of the laser catheter. Laser channels were created in the anterior and lateral walls of the left ventricle without perforation. When the endocardium was detected within 200-400 µm of the catheter tip, laser ablation was terminated. Angiography of the channels demonstrated blood flow into native coronary vasculature draining into the great cardiac vein without communication into the pericardium. Histologic sections showed near complete transmyocardial channels, no perforation, communication with native vessels and minimal acoustic injury. We conclude that OCR appears to be a feasible method to improve the safety and efficacy of percutaneous TMR.

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## EFFECT OF TRANSMYOCARDIAL LASER ON HEART FUNCTION

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**Transmyocardial revascularization (TMR) relieves ischemic symptoms. However, heart failure is a major potential complication. This study evaluated the effect of TMR on myocardial function. Under general anesthesia, hearts were removed from 6 normal rats and placed in oxygenated physiologic solution at 34°C. The left ventricles (3.0 ± 0.2 $cm^2$) were dissected and mounted between a fixed post and a force displacement transducer. Electrical pulses (1 Hz/80 v) were used to stimulate the myocardium at 60 beats/min. TMR was performed by advancing a 300 µm core fiber while irradiating with a Ho:Yag laser (3 Hz, 280 mJ/pulse). Myocardial contractility (shortening in mm/pulse) was evaluated at increasing preloads (1-3 grams) after a series of 20 TMR channels. This was followed by 10 min rest and repeat 20 channels. This sequence was continued until myocardial dysfunction occurred. After 20 channels myocardial contractility decreased with loss of the Frank-Starling response (FSR). However, after 1.5 hr and 120 channels, myocardial contractility improved significantly with increasing preload conditions. Additional channels caused further loss of contractility.**

**Myocardial Contractility (mm/pulse on recorder)**

| Channels | preload = 0 g | preload = 1 g | preload = 2 g | preload = 3 g | p |
|---|---|---|---|---|---|
| 0 | 44.3±23.5 | 57.2±27.9 | 64.7±31.9 | 65.9±30.8 | 0.03 |
| 20 | 38.6±20.4 | 44.4±19.0 | 42.4±19.3 | 38.0±14.5 | 0.31 |
| 60 | 22.4±16.5 | 23.3±17.9 | 22.4±12.1 | 22.0±13.5 | 0.46 |
| 120 | 4.3±3.4 | 23.2±13.2 | 28.9±13.6 | 31.6±6.6 | 0.05 |
| 180 | 6.8±2.1 | 8.4±1.9 | 8.7±1.4 | 11.1±2.5 | 0.22 |

**This study demonstrated that TMR in rat hearts is associated with myocardial dysfunction. However, after 1.5 hr and 120 channels there was a consistent significant recovery of contractility and FSR. This may be due to myocardial preconditioning.**

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## IMPROVED STERILIZATION OF PROSTHETIC VASCULAR GRAFTS USING SHOCK WAVES

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Infection of vascular prosthetic grafts often results in sepsis, prolonged hospitalization, amputation and a 17% mortality. Bacteria that cause these infections proliferate and produce an exopolysaccaride matrix known as biofilm. The biofilm protects the bacteria by preventing antibodies, leukocytes and certain antimicrobial drugs affect the bacteria. It has previously shown that laser-generated shock waves (SW) can increase drug penetration into the biofilms.

Bacteria (*S. Epidermidis*) were cultured from infected prosthetic grafts obtained from patients. Dacron prosthetic vascular grafts were sterilized and then inoculated with the isolated bacteria to allow them to proliferate and form an adherent bacterial layer on both sides of the graft. The presence of the biofilm was assessed by confocal microscopy. The infected grafts underwent the following treatments: a) saline alone, b) saline and SW (23 ns Q-switched ruby laser), c) antibiotic (Vancomycin) alone, and d) antibiotic and SW. After treatment, grafts were sonicated to detach bacteria, the effluent was cultured and the colony forming units (CFU) were counted.

CFU numbers in control specimens were comparable (saline, $3.05 \times 10^8 \pm 0.9$) vs (saline/SW $3.31 \times 10^8 \pm 0.9$). The CFU number diminished to $7.61 \times 10^6 \pm 0.5$ after antibiotic treatment. However the combined treatment (antibiotic and SW) synergistically decreased the CFU number ($1.27 \times 10^4 \pm 0.7$) ($p<0.001$).

This study demonstrated that laser-generated shock waves can improve the delivery of antibiotics across prosthetic vascular graft biofilms, providing direct access to bacteria. This is a new promising approach that can be used to improve antibiotic therapy to eradicate infection in prosthetic materials such as bypass grafts.