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Title: A novel pleural-bladder pump for management of pleural effusion

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Body: Recurrent pleural effusions are common. Pleurodesis has a suboptimal success rate and is unsuitable for patients with trapped lung. The alfapump® system is a battery-powered, fully implantable pump system, designed to move peritoneal fluid to the urinary bladder for excretion. Its safety and effectiveness have been shown in patients with liver disease. Whether the alfapump can be applied to drain pleural effusions warrants investigation. This is a pilot feasibility study to explore the use of the alfapump system in pigs with normal pleura. The animal ethics committee in Hôpital Nord, Marseille, approved the study. Female pigs (30kg, n=2) were anaesthetised and ventilated mechanically. A pleural drainage catheter was inserted under pleuroscopic assistance. A second catheter was inserted into the urinary bladder. Both catheters were tunneled subcutaneously and attached to the pump, which was implanted 6 cm below the costal border. A range of ventilation parameters were tested to create variety of physiological conditions. Fluid was introduced into the pleural space to create multiple effusions to assess the efficacy of the alfapump to remove fluid to the bladder. The alfapump successfully transported fluid from the pleural cavity to the bladder at an average rate of 3.3 ± 0.3 ml/sec. The pressure variations caused by the respiratory cycles and the variations in the amount of fluid (from 0 to 392ml) in the pleural cavity had no impact on the pumping. We confirmed that pumping automatically stopped when the pleural cavity was empty. This study demonstrated that the alfapump could be used successfully in anaesthetised pigs. Its safety and efficacy in the management of pleural effusion requires clinical evaluation.