



## CASE REPORT

# The benefits of digital thoracic drainage system for outpatients undergoing pulmonary resection surgery

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Received 7 December 2010; accepted 14 February 2011

Available online 15 June 2011

### KEYWORDS

Digital thoracic drainage;  
Prolonged air leak;  
Outpatient thoracic surgery

**Abstract** Since digital thoracic drainage system (DTDS) came onto the market, a number of its advantages have become clear, for example that of eliminating the differences between observers. The withdrawal of thoracic drainage has been found to be comfortable, safe and well tolerated by patients; it helps to reduce or eliminate the cost of hospital stay, because, according to the different series published in recent months, it is possible to withdraw drainage sooner and thus discharge patients earlier. Prospective studies are underway, but as yet nothing has been written about the possible benefits in outpatient surgery programmes. In this report we present our findings of 3 cases of patients undergoing pulmonary resection who were treated with continuous intra-domiciliary DTDS. Pending the results of a prospective study now underway our observation is that with properly selected patients this is a safe method.

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### PALAVRAS-CHAVE

Drenagem torácica digital;  
Entrada de ar prolongada;  
Cirurgia torácica em doente de ambulatório

**Vantagens do sistema de drenagem torácica digital para doentes em ambulatório para cirurgia de ressecção pulmonar**

**Resumo** Desde que o sistema de drenagem torácica digital (DTDS) apareceu no mercado, várias das suas vantagens tornaram-se óbvias, como por exemplo o facto de eliminar as diferenças entre os observadores. A remoção do dreno torácico é confortável, segura e bem tolerada pelos doentes; ajuda a reduzir ou a eliminar o custo da estadia hospitalar uma vez que, de acordo com as diferentes séries publicadas nos últimos meses, é possível remover o dreno mais cedo e, assim, dar alta ao doente mais cedo. Estão a ser elaborados estudos, mas ainda não há nada escrito sobre as possíveis vantagens em programas de cirurgia de ambulatório. Neste trabalho apresentamos a nossa experiência em 3 casos de doentes em ambulatório com ressecção pulmonar, que foram tratados com DTDS intra-domiciliar contínua. Até aos resultados de um futuro estudo em elaboração, constatamos que este é um método seguro para doentes devidamente seleccionados.

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## Introduction

One of the most frequent complications of lung surgery is prolonged air leak,<sup>1,2</sup> which leads to more time of thoracic drainage, longer hospital stays and increased hospital costs. From the time the first DTDS came onto the market,<sup>3,4</sup> there have been many studies aimed at demonstrating that with this system the subjective appreciation of air leak can be eliminated.<sup>5</sup>

Prospective, comparative protocols were early introduced in order to demonstrate that drainage time is indeed shortened,<sup>6,7</sup> this includes our study which compares two different types of DTDS with the traditional system.<sup>8</sup> Based on our experience that this system works and having enough proven experience in Outpatient Thoracic Surgery Programmes,<sup>9</sup> we considered the possibility of offering this system to some carefully selected patients.

This study was reviewed and approved by the Hospital Universitari Sagrat Cor ethics committee. All the patients gave their consent, approved their inclusion in this protocol and were instructed on how to use the device.

## Clinical observation

### Case 1

A 53-year-old patient, with a history of COPD and a pulmonary nodule in the right upper lobe, was diagnosed with squamous carcinoma by CT guided fine needle aspiration. There were also multiple bilateral emphysematous bullae, without significant adenopathies in the mediastinum. A right upper lobectomy plus lymphadenectomy was performed, using anterior amiotomic thoracotomy, with a final Stage IA T1aNOM0.

In the post-operative period the patient developed a prolonged air leak between 100 and 150 ml/min, and so on post-operative day 7, she was offered the possibility of being discharged with the digital thoracic drainage device (Thopaz Medela Switzerland®), having been instructed on how to use it. The patient was placed under the daily supervision of one of the surgeons in the team, in 24-hour contact by telephone in case of unforeseen circumstances. (Figs. 1 and 2)

Six days after leaving hospital and 13 after the operation, thoracic drainage was withdrawn as the air leak

in the previous 24 hours had been less than 10 ml/min. This was after assessing the existence of correct clinical re-expansion and no pneumothorax on the chest x-rays.

### Case 2

This case relates to a 36-year-old female patient with a chest x-ray that showed complete atelectasis of the upper left lobe. Fiberoptic bronchoscopy revealed a mass occluding 100% of the upper left lobe bronchus and protruding towards the main bronchus which biopsy proved to be a carcinoid tumour.

A postero-lateral thoracotomy for an upper left lobectomy with bronchoplasty of the main bronchus and mediastinal lymphadenectomy was performed. After 7 days in hospital and radiographic evidence of pulmonary re-expansion, with an air leak of 750-950 ml/hour, having ruled bronchial fistula, the patient was discharged with digital drainage (Thopaz, Medela Switzerland®).

Fifteen days after hospital discharge (22 days after surgery) a gradual reduction of the air leak was verified. Correct clinical and radiographic re-expansion was checked, the digital thoracic drainage air leak had been 0 ml/min for at least the previous 24 hours with no subsequent complications and therefore thoracic drainage was withdrawn.

### Case 3

A 44-year-old female patient with a left-sided spontaneous pneumothorax which had been drained. After persistent air leak for over 7 days we proceeded to undergo surgery via video-assisted thoracoscopy performing resection of bullae and abrasive pleurodesis. After 5 days without complete re-expansion of the lung and with the air leak quantified at 950 ml/minute, discharge was proposed with digital thoracic drainage (Thopaz Medela Switzerland®).

Fifteen days after hospital discharge and 20 after surgery, and with a gradual decrease of the air leak until it was less than 10 ml/min, and with clinical and chest x-ray evidence of pulmonary re-expansion, drainage was withdrawn.



Figure 1 Thopaz Medela is a comfortable and safe device.



**Figure 2** DTDS show us objective numeric parameters like de suction pressure and air leak flow. It represents these parameters in graphics that can be downloaded.

## Discussion

Without doubt the use of DTDS is becoming increasingly popular in more thoracic surgery units, because it has been demonstrated that early withdrawal of thoracic drainage is possible, due to the safety offered by the objective data of air leak in real time and with monitoring from the moment it is attached.<sup>6-8</sup>

We are still a long way off the ideal thoracic drainage that some authors propose,<sup>10</sup> but we are on the right track and work is being done on this. One example is the appearance of other digital drainage systems on the market like those by Redax (Smiths Medical International)<sup>®</sup> and the purchase by Medela of the technology offered by another commercial brand (DigiVent Millicore Sweden<sup>®</sup>). The introduction of a digital device that gives information in real time of the patient's air leak, not just at the bedside, plus the fact that in the future it may be possible to send this information through a PDA, makes it even more feasible for more patients to benefit from short-stay surgery programmes or even outpatient surgery. Our small contribution of three cases serves to demonstrate that this type of monitoring can be carried out with carefully selected patients. All of them lived less than 15 minutes from the hospital, had the knowledge and understanding necessary to be able to use the device, had given their consent and were under 24-hour supervision by the surgeons in charge. It is a real advantage for the patient that although this system requires chest tube aspiration, it does not require connection to a centralised system and it can be monitored at all times, resulting in more comfort at home. It has been shown that intra-hospital costs are reduced with the use of these devices: in one study by €476 per patient per day.<sup>6</sup>

When we compare the use of the digital device with another ambulatory system like the Heimlich valve we can say, that the safety system alarm of the Thopaz in obstruction of the system, makes the digital drainage system a very trustworthy one. With the Heimlich valve, the withdrawal of the drainage is a subjective decision of the surgeon, with the digital device we have a numerical, objective parameter in ml/min that supports our decision. In addition, the Thopaz does not need to be cleaned every day nor the valve changed for the organic residue.

To conclude this preliminary study, which will have to be confirmed by multicentric prospective studies, we make the case that digital thoracic drainage apparatus is safe, comfortable and well accepted by patients. Furthermore, it reduces the number of days in hospital and can be used on outpatients with prolonged air leak.

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