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The Prevalence of Incontinence Pre- and Post-Lung Transplantation

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ABSTRACT

An increased prevalence of urinary incontinence (UI) is reported in patients with chronic lung disease because of the stress that repeated coughing places on the pelvic floor. To date, it is not known if lung transplantation (LTx) affects the prevalence of UI.

Purpose: to compare the prevalence, severity and impact of urinary / faecal incontinence in adult patients pre- and post-LTx.

Method: patients registered with the Royal Adelaide Hospital Lung Transplant Unit were eligible for participation. The prevalence, severity, and impact of incontinence was measured using a questionnaire administered in a private interview.

Results: Ninety-four patients (44 males, 50 females; 42 pre-LTx, 52 post-LTx; mean age 46.3 years [SD 13.0]) completed the questionnaire. The prevalence of UI was significantly higher in patients pre-LTx (69.0%) than patients post-LTx (30.8%), whereas the prevalence of faecal incontinence was similar in the two groups (16.7% pre-LTx, 13.5% post-LTx). In most patients with UI, it was episodic, the amount leaked was small, it was most often associated with coughing and sneezing, and it was perceived as causing few problems. **Conclusion:** LTx appears to be associated with a significant decrease in the prevalence of UI.

INTRODUCTION

There is considerable evidence that the prevalence of urinary incontinence (UI) is increased in females with cystic fibrosis (CF), with the prevalence ranging from 30 - 69% for women and 19 - 49% for girls.¹ The activities usually associated with UI in patients with CF include coughing, sneezing, and exercising.¹⁻⁶ The reason for the increased prevalence of UI in females with CF is unclear, but may include pressure on the pelvic floor from repeated coughing and impaired muscle function.¹ There is also an increased prevalence of UI in patients with other chronic lung diseases.⁷⁻¹² Chiarelli and Brown, investigating 38,936 Australian women aged 18 - 74 years, found the overall prevalence of UI was 28%, but this increased to 45% for women with breathing difficulty, bronchitis, and/or emphysema.⁸ Jones et al found that 66% of 29 patients with chronic lung disease reported stress UI with similar rates reported by Kisack (investigating 60 female asthmatics) and Button et al (in a sample of 22 women with chronic obstructive pulmonary disease), whereas a prevalence of 82% was found by Padopoulos et al for 67 females with chronic obstructive pulmonary disease.^{7,9,10,12}

To date, there has been no research specifically comparing the prevalence of UI pre- and post-LTx, although our clinical impression is of a decreased severity of UI following LTx. The aim of this study was to compare the prevalence, severity, and impact of incontinence in a sample of patients pre- and post-LTx.

METHODS

Subjects

Patients registered with the Royal Adelaide Hospital (RAH) Transplant Unit over a 3.5 year period were eligible for inclusion. Patients attend this Unit when considering or having undergone LTx. The Transplant Unit Physiotherapist (DW) approached each patient individually regarding participation, explaining the study's aims and format. Voluntary participation, confidentiality and anonymity were emphasised and informed written consent obtained. Patients were excluded if they were unwilling to participate or unable to understand English. Approval from the RAH Research Ethics Committee was obtained.

Outcome measures

The prevalence, severity, and impact of urinary and faecal incontinence was measured using a modified questionnaire that has been previously validated and used by the current authors.^{2,13} The questionnaire addresses symptom severity over the last year in terms of frequency of leaking urine / faeces, amount of urine leaked, and activities associated with leaking. The impact of incontinence was addressed with questions about its effect on daily activities. Most questions were closed, but responses were clarified and extra information sought as required, with participants invited to give additional comments. The Transplant Physiotherapist administered the questionnaire in a private face to face / telephone interview. The Transplant Physiotherapist collected background data (Table 1) for each participant from personal interview and/or medical records.

Data Analysis

Each patient had an identifying number and names were not recorded. Data were analysed using SPSS. For most analyses, data were separated according to LTx status (ie pre- or post-LTx). Associations between the prevalence of incontinence and demographic / clinical variables were analysed using the Chi Square test because the data were nominal, with the exception of age where the Independent Samples *t* test was used. It was considered statistically significant when $p < 0.05$.

RESULTS

Over the study period, 86 patients were registered with the RAH Transplant Unit. Four patients died before being approached regarding participation (Figure 1). All remaining 82 patients were included (95.3% participation rate). Of these 82 patients, 12 underwent LTx within the study period. To capture as much data as possible, these 12 patients also completed the same questionnaire post-LTx, thus giving in effect 94 included patients – 42 pre-LTx and 52 post-LTx (Figure 1).

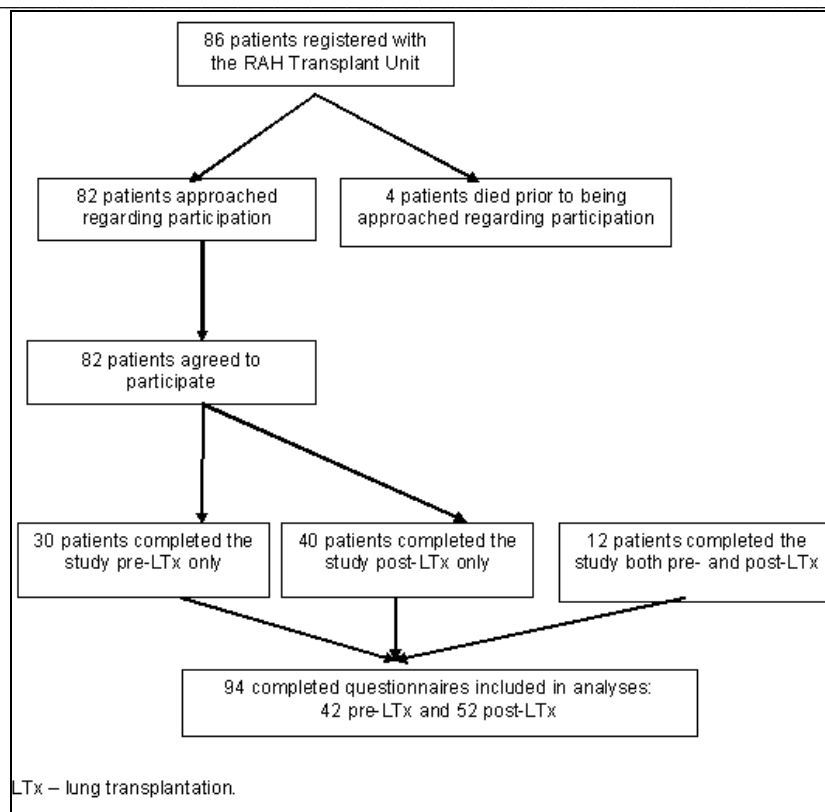


Figure 1: Recruitment of patients for participation in study.

Table 1 provides background information for those completing the questionnaire according to LTx status: patients were pre-LTx on 42 occasions and post-LTx on 52 occasions.

Table 1. Profiles of the 94 patients completing the study according to LTx status

	Pre-LTx patients (n = 42)	Post-LTx patients (n = 52)
Age (years)		
Mean (SD)	47.9 (12.6)	45.0 (13.2)
Range	24 - 64	20 - 65
Sex – n (%)		
Male	21 (50.0)	23 (44.2)
Female	21 (50.0)	29 (55.8)
LTx status		
Pre-LTx – n (%)	42 (100.0)	0
Post-LTx – n (%)	0	52 (100.0)
Single lung		6 (11.5)
Double lung		41 (78.8)
Heart / lung		5 (9.6)
Years since LTx – mean (SD)	N/A	2.9 (3.1)
LTx complications (yes) – n (%)	N/A	26 (50.0)
Primary medical condition – n (%)		
Emphysema	16 (38.1)	13 (25.0)
Cystic fibrosis	8 (19.0)	13 (25.0)
Bronchiectasis	2 (4.8)	8 (15.4)
Pulmonary hypertension	4 (9.5)	6 (11.5)
Idiopathic pulmonary fibrosis	5 (11.9)	3 (5.8)
Alpha 1 anti-trypsin deficiency	2 (4.8)	5 (9.6)
Other	5 (11.9)	4 (7.7)
History of surgery – n (%)	14 (33.3)	13 (25.0) ^a
Bladder	1 (2.4)	1 (1.9)
Gastrointestinal	8 (19.0)	4 (7.7)
Gynaecological	5 (11.9)	9 (17.3)
Obstetric history for females – number of children – n (%)		
None		
One	7 (16.7)	10 (19.2)
Two	1 (2.4)	2 (3.8)
Three	7 (16.7)	11 (21.2)
Four	4 (9.5)	3 (5.8)
	2 (4.8)	3 (5.8)

Percentages are expressed relative to the 42 pre-LTx or 52 post-LTx patients.

^a 1 patient had undergone both bowel and gynaecological surgery.

LTx – lung transplantation; N/A = not applicable.

Prevalence and severity of UI

From the question “How often do you wet or leak urine?” (Table 2), significantly more patients pre-LTx than post-LTx reported UI (29/42 patients pre-LTx [69.0%] vs 16/52 patients post-LTx [30.8%]; $\chi^2= 13.64$, $p = 0.000$). For patients reporting UI (pre- or post-LTx), the most common frequency was < once a month, the most frequently reported amount leaked was damp / a few drops and activities most often associated with UI were coughing and sneezing (Table 2). Nine pre-LTx (21.4%) and 6 patients post-LTx (11.5%) reported using pads for UI.

Table 2. Prevalence and severity of urinary stress incontinence and the prevalence of faecal incontinence over the last year for the patients completing the study (N = 94)

Item	Pre-LTx patients (n = 42) n (%)	Post-LTx patients (n = 52) n (%)
How often do you wet or leak urine?		
> once a day	4 (9.5)	3 (5.8)
Once a day	2 (4.8)	1 (1.9)
2 – 6 times a week	2 (4.8)	2 (3.8)
Once a week	1 (2.4)	0
2 – 4 times a month	0	3 (5.8)
Once a month	3 (7.1)	2 (3.8)
< once a month	17 (40.5)	5 (9.6)
Never	13 (31.0)	36 (69.2)
How much urine do you usually leak?		
Damp / a few drops	19 (45.2)	10 (19.2)
Wet / a small amount	7 (16.7)	4 (7.7)
Quite wet / cupful	1 (2.4)	2 (3.8)
Very wet / floods	2 (4.8)	0
Do you ever wet or leak urine on ...? (yes)		
Coughing	19 (45.2)	13 (25.0)
Sneezing	9 (21.4)	10 (19.2)
Laughing	8 (19.0)	6 (11.5)
Climbing stairs or steps	3 (7.1)	0
Lifting something	4 (9.5)	2 (3.8)
Physical activity	5 (11.9)	3 (5.8)
Keeping fit / sports activity	2 (4.8)	3 (5.8)
During a panic attack	5 (11.9)	1 (1.9)
Sexual intercourse	1 (2.4)	0
Performing lung function tests	2 (4.8)	0
Airway clearance techniques	2 (4.8)	0
Any other activity	3 (7.1)	0
How often do you leak faeces?		
> once a day	0	1 (1.9)
Once a day	0	0
2 – 6 times a week	0	0
Once a week	0	0
2 – 4 times a month	0	1 (1.9)
Once a month	1 (2.4)	0
< once a month	6 (14.3)	5 (9.6)
Never	35 (83.3)	45 (86.5)
Do you ever leak faeces on...? (yes)		
Coughing	2 (4.8)	3 (5.8)
Sneezing	1 (2.4)	2 (3.8)
Laughing	0	2 (3.8)
Climbing stairs or steps	0	1 (1.9)
Lifting something	2 (4.8)	0
Physical activity	1 (2.4)	1 (1.9)
Keeping fit / sports activity	1 (2.4)	1 (1.9)
During a panic attack	2 (4.8)	0
Sexual intercourse	0	0
Performing lung function tests	0	0
Any other activity	2 (4.8)	2 (3.8)

Percentages are expressed relative to the 42 pre-LTx or 52 post-LTx patients.

LTx – lung transplantation.

For patients pre-LTx, a significantly higher prevalence of UI was found in females compared to males (85.7% vs 52.4%; $\chi^2 = 5.46$, $p = 0.019$), whereas age, primary medical condition, and history of bladder, gastrointestinal and/or gynaecological surgery had no significant effect (all p 's > 0.345). Similarly, for patients post-LTx, a significantly higher prevalence of UI was found for

females compared to males (51.7% vs 4.3%; $\chi^2= 13.52$, $p = 0.000$), whereas age, primary medical condition and history of bladder, gastrointestinal and/or gynaecological surgery had no significant effect (all p 's > 0.132).

Given the higher prevalence of UI in females in both pre- and post-LTx groups, further analyses were performed to compare the profiles of females who leaked urine to those who did not (Table 3). A significantly higher prevalence of UI was found in females with children. A trend was seen towards an increased age in females with UI ($p = 0.058$).

Table 3. Profiles of the females who reported leaking of urine compared to females who did not

	Females who reported leaking of urine (n = 33) n (%)	Females who reported no leaking of urine (n = 17) n (%)	Statistical analyses
LTx status – n (%)			
Pre-LTx	18 (54.5)	3 (17.6)	$\chi^2 = 6.27$; $p = 0.012$
Post-LTx	15 (45.5)	14 (82.4)	
Age (years) – mean \pm SD	48.7 \pm 12.5	40.9 \pm 15.2	$t = 1.94$; $p = 0.058$
Number with children (%)	26 (79.8)	7 (41.2)	$\chi^2 = 7.07$; $p = 0.008$
Number who had undergone bladder, gastrointestinal or gynaecological surgery (%)	13 (39.4)	5 (35.7)	$\chi^2 = 4.85$; $p = 0.486$

Percentages are expressed relative to the 33 females who reported leaking of urine or the 17 females who did not report leaking of urine.

LTx – lung transplantation

The data for the 12 patients who completed questionnaires both pre- and post-LTx were also analysed separately. As with the complete sample, significantly more patients pre-LTx than post-LTx reported UI (10/12 patients pre-LTx [83.3%] vs 1/12 patients post-LTx [8.3%]; $\chi^2= 13.59$; $p = 0.0000$).

Prevalence of faecal incontinence

From the question “How often do you leak faeces?” (Table 2), faecal incontinence was reported by 7 of 42 patients pre-LTx (16.7%) and 7 different patients post-LTx (13.5%). The most common frequency was < once a month and the activity most commonly associated with faecal incontinence was coughing. Prevalence of faecal incontinence was not significantly affected by LTx status, sex, age or primary medical condition (all p 's > 0.367). A trend towards a higher prevalence of faecal incontinence was seen in patients who had undergone bladder, gastrointestinal and/or gynaecological surgery compared to those who had not (25.9% vs 10.4%; $\chi^2= 3.64$, $p = 0.056$).

Impact of UI

Although UI was fairly common, it rarely had a major impact on activities and was deemed to be “no problem” / “a bit of a problem” by most who reported it (Table 4).

Table 4. Symptom impact of urinary stress incontinence

Item	Pre-LTx patients (n = 42) n (%)	Post-LTx patients (n = 52) n (%)
How often do you not do some activity (eg a hobby or going out) because you are worried about wetting yourself or leaking?		
N/A as have no incontinence	13 (31.0)	36 (69.2)
Never	27 (64.3)	15 (28.8)
A few times	2 (4.8)	1 (1.9)
About half of the time	0	0
Most of the time	0	0
Always	0	0
How often do you not do some activity (eg going out with friends, shopping etc) because you are worried about needing a toilet?		
N/A as have no incontinence	13 (31.0)	36 (69.2)
Never	25 (59.5)	12 (23.1)
A few times	3 (7.1)	3 (5.8)
About half of the time	0	1 (1.9)
Most of the time	1 (2.4)	0
Always	0	0
Does your bladder problem affect your ...? (yes)		
N/A as don't have a bladder problem	13 (31.0)	36 (69.2)
Holidays	0	1 (1.9)
Family life	1 (2.4)	1 (1.9)
Social life (eg going out, seeing friends)	0	1 (1.9)
Interests / hobbies	0	1 (1.9)
How much of a problem is your incontinence for you?		
N/A as have no incontinence	13 (31.0)	36 (69.2)
No problem	16 (38.1)	7 (13.5)
A bit of a problem	11 (26.2)	8 (15.4)
Quite a problem	1 (2.4)	1 (1.9)
Serious problem	1 (2.4)	0

Percentages are expressed relative to the 42 pre-LTx or 52 post-LTx patients.

LTx – lung transplantation; N/A – not applicable.

Effect of LTx on incontinence

Of the 52 patients post-LTx, 23 (44.2%) had never had incontinence, 2 (3.8%) reported their incontinence had not changed since LTx, 19 (36.5%) reported their incontinence had improved, 5 (9.6%) reported it had got worse and 3 patients (5.8%) had mixed results. Details regarding these changes are provided in the next 3 paragraphs.

As noted, 19 patients post-LTx reported improved incontinence since LTx. Eleven of these 19 patients reported complete resolution of pre-LTx stress UI. Five patients reported the frequency and/or amount of stress UI had decreased since LTx. The remaining 3 patients with improved incontinence post-LTx reported resolution of: urge UI (1 patient), faecal incontinence (1 patient), urinary stress and faecal incontinence (1 patient).

Five patients post-LTx reported worsening incontinence since LTx. One of these, a 63yo female (4 children) reported no incontinence pre-LTx, but since LTx had developed intermittent stress UI (once a month) associated with recurrent urinary tract infections and coughing. The second of these 5 patients, a 65yo female (2 children), reported the onset of urge UI post-LTx. The third, a 54yo female (2 children), reported the onset of nocturnal UI which she attributed to menopausal onset rather than LTx. The fourth, a 65yo female (4 children), reported that while her UI had not changed post-LTx, she had developed faecal incontinence. Finally, a 39yo female (2 children) reported that not only was her UI worse post-LTx, but she had also developed occasional faecal incontinence.

Three patients post-LTx reported mixed effects of LTx on incontinence. One of these, a 56yo female (2 children), reported that while her UI had improved since LTx, she had developed frequent faecal incontinence. The second, a 50yo female (2 children), reported that while her faecal urge incontinence had improved post-LTx, she had developed slight UI. The third patient, a 65yo female (2 children), reported that while she had less frequent UI since LTx, the amount leaked had increased.

Further analyses compared the profiles of the 8 patients post-LTx whose incontinence got worse or who had mixed results post-LTx ($n = 5$ and $n = 3$ respectively) to the remaining patients post-LTx (ie $n = 52 - 8$). The 8 patients whose incontinence got worse or had mixed results post-LTx were significantly older (57.1 vs 42.8 years, $t = -3.044$, $p = 0.004$), more likely to be female (100% vs 47.7%, $\chi^2 = 7.50$, $p = 0.006$) and have children (100% vs 25.0%, $\chi^2 = 16.42$, $p = 0.000$), whereas no significant effect was found for primary medical condition, whether patients had undergone bladder, gastrointestinal and/or gynaecological surgery or had post-LTx complications (all p 's > 0.081).

DISCUSSION

LTx appeared to be associated with a reduction in UI, with a significantly lower prevalence of UI found in patients post-LTx (30.8%) than pre-LTx (69.0%). Furthermore, 36.5% of patients post-LTx reported an improvement in incontinence following LTx and data from the 12 patients who completed questionnaires both pre- and post-LTx showed a significant and dramatic reduction in the prevalence of UI (83.3% pre-LTx to 8.3% post-LTx). While this lower prevalence of UI post-LTx may be coincidental, there may be a reduced need to cough post-LTx and/or a general improvement in health resulting in less incontinence. Certainly the patients whose incontinence improved post-LTx were pleased about this unexpected outcome. However, of concern were the 8 patients whose incontinence had worsened or who had mixed effects post-LTx. Due to the small number involved, it is not possible to draw definite conclusions as to why their incontinence deteriorated post-LTx or if it was even related to LTx. Nevertheless, worsening incontinence may be a potential complication of LTx, if only for a minority.

The 69.0% prevalence of UI found in this study for patients pre-LTx is at the upper limit of the range described for patients with CF, similar to the prevalence rates reported by Kisack for women with asthma and Jones et al for patients with chronic lung disease, but well above that found in the general population for women of similar age.^{1-9,12,14-16} This high prevalence of UI in patients pre-LTx may reflect that they had, by necessity, severe underlying lung disease in order to be on a waiting list for LTx. The 30.8% prevalence of UI seen in patients post-LTx in the current study is at the lower end of the range for patients with CF and similar to that found in the general Australian population of similar age.^{1-6,8,12,14-16}

The factors that we found to be significantly associated with an increased prevalence of UI were being pre-LTx and female, whereas age, primary medical condition, and whether the patient had undergone bladder, gastrointestinal, and/or gynaecological surgery had no significant effect. Additionally, as anticipated, for females (either pre- or post-LTx) who reported UI, a significantly higher prevalence of UI was found in those with children and a trend was seen towards a higher prevalence with increasing age. These risk factors are similar to those identified in the normal population and in patients with CF.^{3,5}

In keeping with previous research, the UI reported in this sample of patients was usually episodic and associated with activities that stressed the pelvic floor.^{1-6,14} Most patients with UI in the current study reported that it did not have a major impact on activities, nor was it perceived as a major problem, thus supporting previous studies involving patients with CF.^{1,2,5} In contrast, research involving the general population found that most subjects with UI perceive it as having a fairly significant impact.¹⁷ That the UI reported in the current study was usually episodic and small in volume may be important, although Nixon et al noted that the relationship between the severity or frequency of UI and its impact on daily life is not straightforward.⁵ Alternatively, it may be that UI is viewed as relatively unimportant compared to the underlying lung disease for patients pre-LTx or the ongoing complicated management post-LTx.

Faecal incontinence was relatively uncommon in the current study, occurring in approximately 15% of patients pre- and post-LTx, similar to the 24% prevalence reported by Jones et al for patients with chronic lung disease, whereas a 0% prevalence was found by White et al for 71 adults with CF.^{2,9} The reason for this variation is unclear, although it may reflect the older age of participants in the current study compared to those of White et al (mean 46.3 vs 24.6 years respectively).²

In terms of study design, we deliberately included patients pre-LTx so that the data from the post-LTx group could be measured against a comparable sample, rather than solely relying on comparison with data from previous research that has involved patients with chronic lung diseases and a wider range of disease severity. We also chose to include males in the study rather than females only, despite evidence that UI is more common in females with lung disease, as we did not know if the female preponderance of UI would hold for our sample, given that this was the first study to specifically investigate UI associated with LTx.^{1-3,6} We chose to administer the questionnaire via face to face or telephone interview instead of a postal questionnaire to maximise response rate, allow immediate clarification of inconsistencies and enable participants to ask questions. While it could be argued that more honest answers to such a sensitive topic may have been obtained in a postal questionnaire, in practice all participants were willing to answer questions and did not appear embarrassed by the subject matter. Many participants had regularly seen the Transplant Physiotherapist in the past, and as incontinence issues form part of the routine screening process,

discussion of such issues was not new. For a minority, their participation was their first exposure to the Transplant Physiotherapist. Despite this, these patients seemed to welcome the opportunity to discuss incontinence, to realise it was a common problem and receive advice regarding its management.

This study should be replicated with other groups of patients pre- and post-LTx to validate our finding that the prevalence of UI decreases post-LTx. Given the comparatively high prevalence of UI in this sample of patients awaiting LTx, health care professionals involved with similar patient groups should be proactive in questioning patients about symptoms of UI, discuss the risk of UI as part of patients' routine education, advise patients regarding the need for pelvic floor exercises, and if necessary, refer affected patients to a specialist continence physiotherapist.

CONCLUSION

In this study, LTx appeared to be associated with a fall in the prevalence of UI. The prevalence of UI in patients pre-LTx was considerably higher than would be expected in a general population of similar age. For most patients UI was episodic and associated with activities that stressed the pelvic floor. Risk factors for UI included being pre-LTx and female. Health care professionals involved in the management of patients awaiting LTx should question them regarding symptoms of UI and provide advice regarding pelvic floor exercises. Improvement in UI may be an added previously unrecognised benefit of LTx.

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