

Tenckhoff Catheter Implantation in Refractory Ascites Due to Right Heart Failure

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Abstract

Tenckhoff catheter implantation and modified peritoneal dialysis as a novel therapeutic approach in diuretic resistant congestive heart failure: a single-centre case-series.

Background: Progressive renal insufficiency and diuretic resistance represent significant challenges in the management of advanced heart failure, particularly in the context of intractable ascites due to Right Heart Failure (RHF). There is growing interest in the potential use of intermittent paracentesis and peritoneal dialytic ultra-filtration in this setting but clinical experience is limited.

Methods: We undertook retrospective analysis of changes in the following clinical parameters in six patients (66% males, average age 53 years) who underwent Tenckhoff catheter implantation (TCI) for the management of RHF-related intractable ascites i) body weight; ii) number of heart failure related admissions and time spent in hospital; and iii) diuretic requirements. Student t-test was performed to analyse statistical significance.

Results: Follow-up ranged from 4 to 16 weeks post TCI. Compared to immediately prior to TCI: i) 83% (5/6) of patients experienced an improvement in renal function; ii) average weight fell from 72.2 ± 4.7 to 67.7 ± 3.9 kg (mean \pm SEM, $p = 0.054$); iii) none of the patients have required heart failure related admission compared to an average number of 40 days in hospital over 6.7 admissions in the twelve months preceding TCI and iv) frusemide dose decreased from 263 ± 49 to 140 ± 50 mg/day, $p = 0.051$). All patients report a subjective improvement in overall wellbeing and quality of life. One patient developed peritonitis which was controlled with antibiotic treatment without needing catheter removal.

Conclusion: Our experience supports the use of TCI as a therapeutic modality in patients with RHF and intractable ascites resistant to medical management.

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Introduction

Diuretic therapy is often utilized as first line therapy in patients with acute decompensated heart failure with fluid overload^[1-4]. However there is an increasing incidence of heart failure that is refractory to diuretic therapy^[5-9]. It is associated with high morbidity and mortality with average documented survival of 50% at 6 months^[10]. With improved understanding of the physiology and techniques of peritoneal dialysis, ambulatory peritoneal ultrafiltration can be applied to the management of refractory heart failure in addition to conventional diuretic therapy with favourable outcomes^[11-18]. The main advantages of ambulatory peritoneal ultrafiltration over conventional haemodialysis for fluid removal include less dysrhythmias, haemodynamic fluctuations and fluid shifts^[19-22].

A further expansion of the peritoneal ultrafiltration technique is the implantation of a Tenckhoff catheter (TCI) to enable intermittent paracentesis as an adjunct to diuretic therapy in patients with refractory ascites due to malignancy, cirrhosis, renal failure and right heart failure. Its utility in these settings have been reported in case series and case reports to have beneficial and sustained impact on overall fluid balance and ascitic fluid volume^[23-25].

We describe our experience using this modality in the management of refractory ascites due to right heart failure.

Method

A retrospective single centre analysis of 6 patients with intractable ascites due to right heart failure who proceeded to Tenckhoff Catheter Implantation (TCI) was undertaken. Their baseline characteristics are tabulated in Table 1.

Table 1: Patient Characteristics

Patient	Age	Sex	Etiology of Cardiomyopathy/NYHA Class prior to TCI	Weight (Kg) prior to TCI	Duration in hospital pre implantation days/ admissions per year	Diuretic use prior to TCI	PD Regimen/ Intermittent Paracentesis
1	69	M	DCM/ RHD NYHA 3	90	29 / 6	Frusemide 250 mg bd + Dithiazide 25 mg daily	Icodextrin overnight PD
2	44	F	Constrictive Pericarditis NYHA 3	57	49 / 7	Frusemide 80 mg tds + Spironolactone 25 mg daily + dithiazide 12.5 mg bd	Icodextrin BD UF
3	67	F	ICM NYHA	69	40/ 4	Frusemide 120 mg bd + HCT 25 mg daily	Icodextrin BD UF
4	49	M	HCM NYHA 3	80	37 / 6	Frusemide 160 mg bd + Spironolactone 50 mg daily	PD 3x/ day
5	50	M	DCM NYHA 3	73	34/6	Frusemide 80 mg bd + Spironolactone 25 mg daily	Intermittent paracentesis daily
6	39	M	HCM NYHA4	70	49/ 11	PD	Frusemide 120 mg /80 mg

DCM: Dilated Cardiomyopathy; HCM: Hypertrophic Cardiomyopathy; RHD: Right Heart Disease; NYHA: New York Heart Association; ICM: Ischemic Cardiomyopathy; PD: Peritoneal Dialysis; BD: Twice daily; UF: Ultrafiltration;

These patients had failed to respond to maximal doses of diuretics including a combination of loop diuretics, thiazide diuretics and aldosterone receptor antagonist. They were deemed to be in refractory right heart failure by a consultant nephrologists and consultant heart transplant physician. All patients in these series were assessed by the same consultant physicians. All 6 patients were between NYHA class 3 and 4 at time of TCI (Table 2).

Table 2: Results

Patient	Weight (kg)	Diuretic use	Heart failure admissions/NYHA Class Post TCI
1	80	Frusemide 120 mg bd	Nil at 3 months/ NYHA 2
2	56	Frusemide 80 mg bd+ HCT 12.5 mg daily	Nil at 3 months NYHA 2
3	62	Frusemide 80 mg daily	1 admission for unrelated infection NYHA 1-2
4	79	Frusemide 160 mg bd + Spironolactone 50 mg daily	Nil at 3 months NYHA 2
5	63	Frusemide 40 mg daily	Nil at 3 months NYHA1-2
6	65	CAPD	1 admission for peritonitis NYHA3-4

Patients were all educated on ascitic drain care and underwent education sessions supervised by trained dialysis nurses at St Vincents Hospital. Pts were instructed to do twice daily drains initially whilst the catheter was less than 2 weeks old. Once the site was healed, they were advised to perform daily drains. The transition and safety to proceed to once daily drains was supervised by the trained dialysis nurses. If the volume of drainage was consistently < 500mls/day, they were then instructed to continue to perform twice daily drains.

Patients remained on ascitic drainage without peritoneal dialysis unless they had significant deterioration in their renal function or adequate fluid balance was not satisfactorily attained. Clinically inadequate drainage was deemed as clinical edema on examination or symptomatic progression of shortness of breath due to increasing fluid overload.

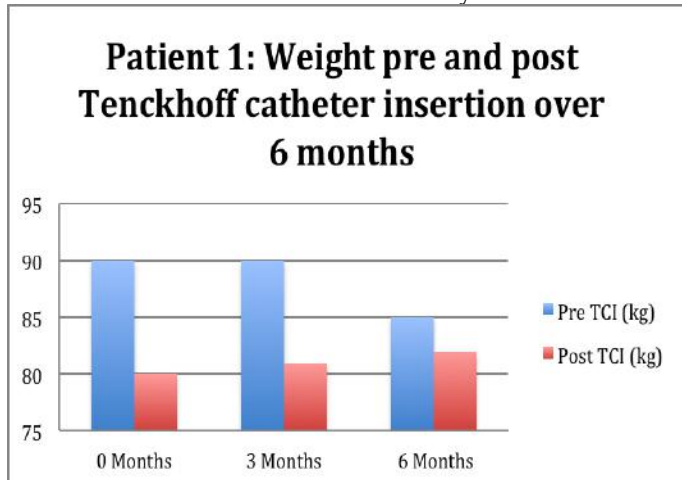
Patients who required the transition to chronic ambulatory peritoneal dialysis underwent ultrafiltration on a regimen of 7.5% Icodextrin solution with an overall volume of 1.5L to 2L and a dwell time of 12 hours. Initially they were commenced on overnight dwells however this was increased to twice daily exchanges if they were unable to maintain fluid balance with single dwells. Changes in the following clinical parameters were reviewed and documented over a 12 month period divided into 6 months pre and

post TCI implantation:

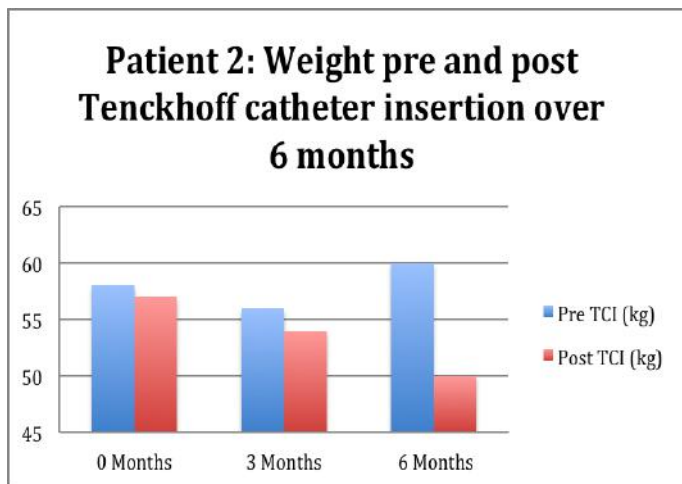
- i) Body weight; ii) Number of heart failure related admissions;
- iii) time spent in hospital; iv) Diuretic requirements.

Student t-test was then applied to ascertain statistical significance.

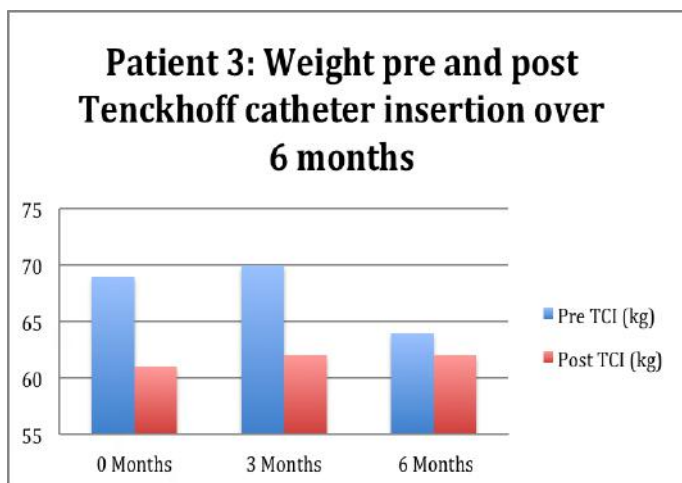
These results were then tabulated and analysed.



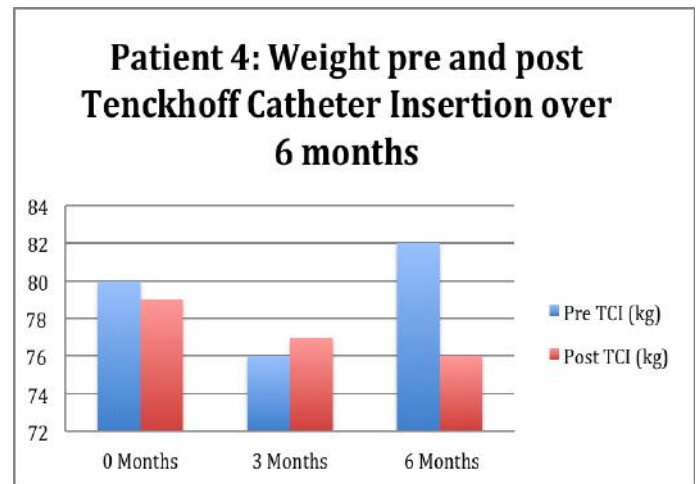
Patient 1:



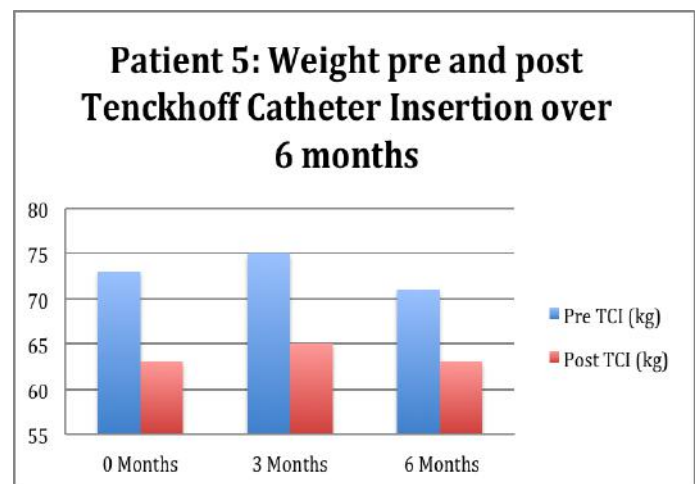
Patient 2



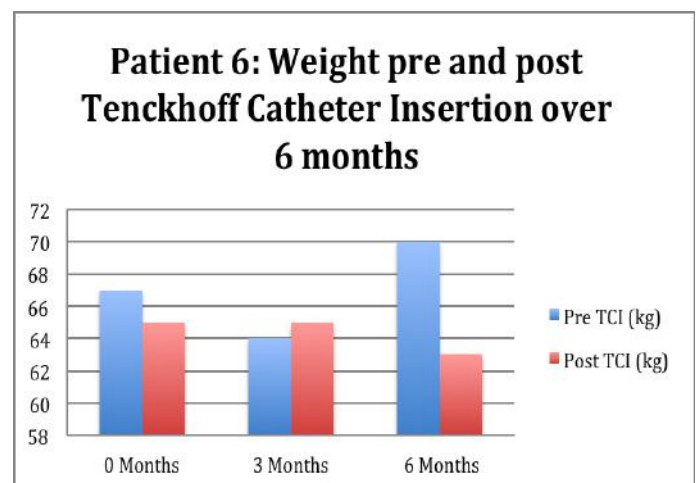
Patient 3



Patient 4



Patient 5



Patient 6

Figure 1: Graphical Representation of Weight Changes in the 6 months preceding and post TCI

Results Continued

Compared to prior to TCI 83% (5/6) of patients experienced an improvement in renal function. Table 2.

Their diuretic dose decreased from 263 ± 49 to 140 ± 50 mg/day, $p = 0.05$, demonstrating improved diuretic sensitivity with intermittent ambulatory PD use. Table 2

The average weight fell from 72.2 ± 4.7 to 67.7 ± 3.9 kg

(mean \pm SEM, $p = 0.054$). This is depicted graphically in Figure 1 where in the 6 months post TCI there was a marked and consistent improvement in average weight compared to 6 months pre TCI. Table 2

None of the patients were admitted for heart failure post TCI heart failure compared to an average number of 40 days in hospital over 6.7 admissions in the twelve months preceding TCI.

All patients report a subjective improvement in overall wellbeing and quality of life. 4 patients experienced an objective improvement in NYHA class within the first month of TCI.

Of the 6 patients, 4 transitioned onto a full dialysis/APD prescription due to end stage renal failure. 1 out of the 6 patients required APD from the offset due to poor renal function.

One patient developed peritonitis that was controlled with antibiotic treatment without needing catheter removal

Discussion

We have described 6 patients with refractory heart failure and ascites, unresponsive to medical management who showed a rapid and sustained improvement in symptoms and quality of life with the use of intermittent ambulatory peritoneal dialysis. This was potentially due to the enhanced removal of sodium and water through the utility of ultrafiltration into the peritoneal cavity^[26].

This facilitates more effective driving of fluid from the interstitium back into the intravascular space, improving fluid removal, renal perfusion and renal function^[26]. This is mirrored in the results of RAPID- CHF and the UNLOAD trials that showed ultrafiltration resulted in more fluid removal and weight loss than treatment with diuretics^[27,28]. Several other studies have also demonstrated more effective fluid removal with ultrafiltration with the limitation of a diuretic only control arm^[29-32]. This benefit was also shown with the utility of peritoneal dialysis in Mehrotra et al, Khalifeh et al and Sanchez et al^[15-17].

In addition there was an added benefit of regaining diuretic sensitivity in PD use which was also demonstrated in our case series where 5 out of 6 of our patients had a reduction and improved diuresis with lower doses of diuretic therapy^[15].

In our cohort, 4 out of the 6 patients who initially were on icodextrin prescriptions progressed to requiring 9 hour treatments on automated peritoneal dialysis for ultrafiltration. 3 of these patients subsequently developed end stage renal failure which necessitated a dialysis prescription in addition to the ultrafiltration. 2 of these 3 patients were placed on a combined heart kidney transplant list due to progression of both their heart and kidney failure.

The UNLOAD study and a case series of 25 patient treated with ultrafiltration also showed a decrease in rehospitalisation and overall hospitalizations in the ultrafiltration cohort^[28,29]. This potentially reduces the incidence of the myriad of complications associated with recurrent hospital admissions and in our series led to improvement in patient quality of life measures and general state of well being.

The major complication associated with TCI are catheter and procedure related complications mainly bleeding and peritonitis. One of our patients did develop PD peritonitis but this was successfully managed with oral and intraperitoneal antibiotics that negated the need for Tenckhoff catheter removal,

with minimal interruption to his CAPD regimen.

Conclusion

At this time there remains no effective decongestive treatment for patients with acute decompensated heart failure and refractory ascites. The utility of TCI and intermittent ambulatory peritoneal dialysis for more efficient and sustained fluid removal may lead to overall improvement in fluid balance and symptomatic relief.

Conflicts of Interest: No disclosures in the submission of this work.

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