

Prospective investigation of the incidence of falls, dizziness and syncope in haemodialysis patients

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Received: 14 March 2006 / Accepted: 26 July 2006 / Published online: 21 February 2007
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Abstract

Background Prevention of falls in the elderly is a major health care target. There are theoretical reasons why older dialysis patients may be at high risk of falls: co-morbidity, medication, and post-dialysis hypotension, which have not been well tested. Dialysis patients are also at higher risk of fracture if they do fall.

Methods We prospectively interviewed all our centre haemodialysis patients over a 6 month period to see if they reported falls, syncope, pre-syncope or dizziness. Routine blood pressure (BP) and other clinical data were recorded.

Results A total of 78 patients completed the study. There was a high incidence of all four symptoms but only falls was age-related. About 38% of patients aged >65 reported 1 or more fall compared to 4% of younger patients ($p < 0.001$). There were no significant differences in pre-dialysis, post-dialysis or standing BP between young and older patients or between fallers and non-

fallers although the older patients did have a greater magnitude in change between pre-dialysis BP and post-dialysis standing BP.

Conclusions Older haemodialysis patients have a high incidence of falls. Falls can be prevented by addressing modifiable risk factors. Whether existing guidelines are applicable to this specialised population is uncertain. There is a high incidence of syncope in dialysis patients of all ages and the cause of this needs further exploration.

Keywords Blood pressure · Elderly · Dialysis · Falls · Haemodialysis · Fracture · Kidney disease · Orthostatic hypotension · Syncope

Introduction

Falls prevention is a major target for those involved in the health care of older persons. This is because falls are common, often preventable and have major consequences in terms of both morbidity and mortality [1]. There are several reasons why older dialysis patients may be at particular high risk of falls including cardiovascular disease, autonomic neuropathy, myopathy, polypharmacy, fluid shifts during and after dialysis sessions and depression [2].

Autonomic nervous system dysfunction has been documented in patients with end stage

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renal disease [3] and we have previously identified a high incidence of orthostatic hypotension in a cohort of dialysis patients aged over 70 years who retrospectively recalled a high incidence of falls, dizziness and syncope over the previous year [4]. Patients on haemodialysis may be at particular risk immediately post-dialysis as a consequence of the removal of large volumes of fluid from the intra-vascular space during dialysis. This may be less well tolerated in older subjects.

Falls are important because in the non-renal elderly it has been demonstrated that multi-disciplinary intervention can reduce the incidence of falls [1] and for renal patients there is the added incentive that there is a higher fracture incidence [5]. An additional concern is that not only do falls lead to injury but also psychological and quality of life issues as a consequence of the ‘fear of falling’ syndrome [6]. A recent study in Canada reports a recalled incidence of falls amongst seniors on dialysis at least as high as among community-dwelling elders [7]. However retrospective recall studies may under-estimate the true incidence of falls by 30–50% [8] and we therefore decided to prospectively study a cohort of haemodialysis patients of all ages to determine the incidence of falls and syncope and to look for any associations with routine clinical data.

Subjects and methods

A cohort of 78 hospital haemodialysis patients of all ages was studied in a single main-centre dialysis unit. Of patients studied, 27 were female, the mean age was 58 (range 22–82), 32 were aged ≥ 65 years.

A simple falls questionnaire was administered during each dialysis treatment session over a six-month period by the patients’ regular dialysis nurse (Fig. 1).

In addition, routine demographic and clinical data was collected including pre- and post-dialysis blood pressure and post-dialysis standing blood pressure. The questionnaire data was analysed using Chi squared tests and the clinical data by one-sample *t*-test.

Haemodialysis Falls Questionnaire

Please ask the following 4 questions to your patients during each dialysis session and record the answers on the diary card provided.

1. Since your last dialysis session have you felt dizzy at any time?
2. Have you blacked out, lost consciousness or fainted since you last had dialysis?
3. Have you felt like you were about to faint?
4. Have you had any falls since your last dialysis session?

Fig. 1 Haemodialysis falls questionnaire

Results

There was a high incidence of all four symptoms in this patient group but only falls was clearly age related. Of older patients 38% fell compared to 4% of the younger patients (Fig. 2). We recorded 1.76 falls/patient year in the older group compared to 0.13 falls/patient year in younger patients. (Older patients are defined as those aged ≥ 65 at the start of the study period). In contrast, 22% of younger patients reported syncope compared to 28% of older patients, while the respective values for pre-syncope were 48% young and 50% old and for dizziness 78% in both groups. The incidence of syncope was 1.51 events/patient year for older patients and 0.79 events/patient year for younger patients.

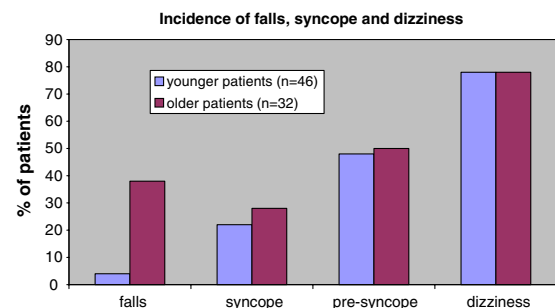


Fig. 2 Percent of older (≥ 65) or younger (< 65) patients reporting falls, syncope, pre-syncope or dizziness during the 6 month period. There was a significantly higher incidence of falls in the older patients (chi-squared test, $p < 0.001$) but not for the other symptoms

Figure 3 shows that there is a considerable overlap in symptoms with only a minority at all ages reporting no symptoms at all.

Routine blood pressure measurements were examined (pre-dialysis supine and post-dialysis supine and standing blood pressures). There was no relationship between any of these blood pressures and any of the symptoms (Table 1). There was a trend towards a greater fall in blood pressure following dialysis in the older patients and this did reach statistical significance when comparing the pre-dialysis supine blood pressure with the post-dialysis standing blood pressure (Table 2). There was however no significant blood pressure difference when comparing elderly fallers with elderly non-fallers.

There was no difference in either haemoglobin concentration or numbers of medications when comparing young with elderly or fallers with non-fallers.

Discussion

In this 6-month prospective study, 38% of the older patients fell, 28% experienced syncope and 53% either fell or experienced syncope. Only 4% of the younger patients fell although 22% reported syncope. There was no relationship between the incidence of these symptoms and the routine blood pressures recorded on the unit nor with haemoglobin concentration or number of medications.

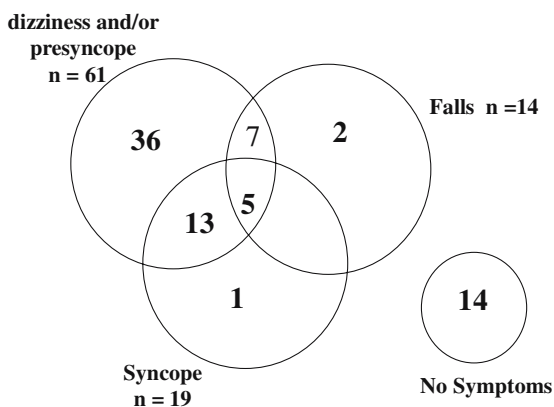


Fig. 3 Venn diagram illustrating the considerable overlap between symptoms amongst all subjects

We believe that this study demonstrates that it is easy for the dialysis nurses to collect valuable information on the incidence of falls and syncope amongst their patients. This avoids the known under reporting when patients are asked to retrospectively recall events [8].

Our data does confirm the hypothesis that falls rates are high in older haemodialysis patients when compared with figures for community dwelling elderly [9]. However, there is very little published data on the incidence of falls or syncope in dialysis patients. In an earlier study in which we asked patients to recall symptoms over the previous year, we found that 13/47 patients aged >70 reported falls and 8/47 syncope [4]. In a retrospective study of a cohort of patients in Canada aged >65 37% recalled falls during the previous 12 month [7].

We have demonstrated a high incidence of falls and syncope in a group of patients at higher than normal risk of fracture. Data from the USA not only shows an increase in the incidence of hip fracture in dialysis patients compared to the general population but that these fractures are sustained at an earlier age among dialysis patients than in the general population [10]. Fractures and particularly hip fractures are a major cause of morbidity and mortality to older patients; it has been reported that 33% of elderly patients who sustain a hip fracture die within one year [11] and in the USA a 2.4 times greater one year mortality rate after hip fracture for dialysis patients compared to the general population [10].

The collection of data on the incidence of falls among dialysis patients is important not only because of the risks from falls already discussed but because falls represent a preventable health risk. It has been demonstrated in non-renal elderly that multi-disciplinary interventions targeted at particular risk factors can reduce the incidence of falls [1] and guidelines have been produced for the prevention of falls in the elderly [12]. However, it may not be appropriate simply to extrapolate such guidelines to a specialised population such as older dialysis patients. The data from which these guidelines were developed is largely derived from emergency department attendees with falls and community-dwelling elderly and there is published evidence suggesting

Table 1 Pre-dialysis supine, post-dialysis supine and post-dialysis standing blood pressures (means plus standard deviations are shown in mmHg). There were no significant

differences between any of the blood pressures comparing young with elderly or elderly fallers with elderly non-fallers

	Pre-dialysis blood pressure (mmHg)	Post-dialysis blood pressure (mmHg)	Standing blood pressure (post-dialysis)(mmHg)
Young	$\frac{136}{78}$ (20) (10)	$\frac{125}{75}$ (19) (10)	$\frac{119}{72}$ (18) (10)
Elderly	$\frac{152}{76}$ (22) (9)	$\frac{133}{70}$ (22) (9)	$\frac{122}{67}$ (67) (9)
Elderly falls/syncope	$\frac{154}{76}$ (18) (7)	$\frac{136}{70}$ (18) (8)	$\frac{119}{66}$ (19) (11)
Elderly no falls/syncope	$\frac{149}{76}$ (25) (12)	$\frac{131}{70}$ (27) (11)	$\frac{125}{68}$ (23) (7)

Means are shown with standard deviations in brackets

Table 2 Change in blood pressure. Data shown is the mean differences between pre-dialysis and post-dialysis supine blood pressure for the group and between pre-dialysis supine blood pressure and the post-dialysis standing blood pressure in mmHg. There is a greater magnitude of fall in blood pressure for the older patientsalthough this is only statistically significant when comparing pre-dialysis systolic BP with post-dialysis standing systolic BP ($p = 0.017$). There was no difference in these values comparing elderly fallers with elderly non-fallers

	Pre-post dialysis change in blood pressure (mmHg)	Pre-post dialysis standing change in blood pressure (mmHg)
Young	$\frac{11.2}{3.4} \pm$ (17.4) (7.8)	$\frac{18.5}{6.1} \pm$ (20.9) (8.4)
Elderly	$\frac{18.2}{5.7} \pm$ (15.7) (8.2)	$\frac{30.8}{9.7} \pm$ (20.5) (9.4)

Means are shown with standard deviation in brackets

that specialised sub-groups of patients will need a different approach [13]. Older dialysis patients tend to be frailer and with multiple co-morbidities compared to healthy elderly and there are dialysis treatment specific factors, which may be highly relevant to falls such as post-dialysis postural hypotension and 'dry weight' targets.

The incidence of syncope in a six-month period is far higher than has been reported for community dwellers over a much longer period [14]. People with postural hypotension, vasovagal syncope, and carotid sinus syndrome can present with falls, syncope and dizziness and sometimes all three [15]. The high incidence of all three in this group suggests cardiovascular problems such as hypotension may be contributing especially in older individuals. We know from earlier work there is a high incidence of postural hypotension post-dialysis [4]. Fluid shifts precipitating hypotension and postural hypotension are likely to be a factor in this high incidence of syncopal events but further work needs to establish this to be so. Furthermore, syncope can present as falls in older

people [16]. There were 24 syncopal events recorded in the older patients although 11 of these were attributed to one patient. Not all syncopal events will result in a fall but some do, so our true falls incidence in the older patients may be greater than the 1.76 falls/patient year recorded. It may also be the case that falls is a more precise symptom than the other three and easier to record on a patient questionnaire.

There is a need for more detailed investigation of the cause and modifiable risk factors for both falls among older dialysis patients and syncope in all haemodialysis patients. Further research is needed to establish if the standard practice of addressing all modifiable risk factors for falling through a multi-disciplinary approach [12] will reduce the incidence of falls in older people on haemodialysis. This research raises more questions than it can answer. Are patients at particular risk of falling in the few hours following haemodialysis? Is the postural hypotension detected in earlier studies a significant factor? Is hypotension occurring at other times? Could postural

hypotension post-dialysis be moderated? Is strength and balance impaired and if so would a tailored exercise programme help prevent falls and so on? The dialysis unit represents a real opportunity for these patients. Patients attend the unit on a regular basis and there is already a thriving culture of the multi-disciplinary team approach in dialysis. Perhaps the typical renal multi-disciplinary team needs some new team members such as physiotherapists and occupational therapists with elderly care experience.

References

1. Tinetti ME, Baker DI, McAvay, et al (1994) A multifactorial intervention to reduce the risk of falling among elderly people living in the community. *N Engl J Med* 331:821–827
2. Sims RJA, Cassidy MJD, Masud T (2003) The increasing numbers of older patients with renal disease. *BMJ* 327:463–464
3. Jassal SV, Douglas JF, Stout RW (1998) Prevalence of central autonomic neuropathy in elderly dialysis patients. *Nephrol Dial Transplant* 13:1702–1708
4. Roberts RG, Kenny RA, Brierley EJ (2003) Are elderly haemodialysis patients at risk of falls and postural hypotension. *Int Urol Nephrol* 35:415–421
5. Alem AM, Sherrard DJ, Gillen DL, et al (2000) Increased risk of hip fracture among patients with end-stage renal disease. *Kidney Int* 58:396–399
6. Tinetti ME, Mendes de Leon CF, Doucette JT, Baker DI (1994) Fear of falling and fall-related efficacy in relationship to functioning among community-living elders. *J Gerontol* 49:M140–M147
7. Cook WL, Jassal SV (2005) Prevalence of falls among seniors maintained on hemodialysis. *Int Urol Nephrol* 37:649–652
8. Cummings SR, Nevitt MC, Kidd S (1988) Forgetting falls. The limited accuracy of recall of falls in the elderly. *J Am Geriatr Soc* 36:613–616
9. Tinetti ME, Speechley M, Ginter SF (1988) Risk factors for falls among elderly persons living in the community. *N Engl J Med* 319:1701–1707
10. Coco M, Rush H (2000) Increased incidence of hip fractures in dialysis patients with low serum parathyroid hormone. *Am J Kid Dis* 36:1115–1121
11. Keene GS, Parker MJ, Pryor GA (1993) Mortality and morbidity after hip fractures. *BMJ* 307:1248–1250
12. Guideline for the prevention of falls in older persons. *J Am Geriatr Soc* 2001; 49:664–672
13. Shaw FE, Bond J, Richardson DA, et al (2003) Multifactorial intervention after a fall in older people with cognitive impairment and dementia presenting to the accident and emergency department: randomised controlled trial. *BMJ* 326:73–78
14. Soteriades ES, Evans JC, Larson MG, et al (2002) Incidence and prognosis of syncope. *NEJM* 347:878–885
15. McIntosh SJ, DaCosta D, Kenny RA (1993) Outcome of an integrated approach to the investigation of dizziness, falls and syncope in elderly patients referred to a ‘syncope’ clinic. *Age Ageing* 22:53–58
16. Shaw FE, Kenny RA (1997) The overlap between syncope and falls in the elderly. *Postgrad Med J* 73:635–639