Cerebral oxygenation as measured by TOI was lowest in the upright position and highest in the supine position. Future studies should address the effects of positioning on cerebral oxygenation and outcome after stroke.

Supplementary data

Supplementary data for this article are available at Age and Ageing online.


References


Positional vertigo in a falls service

SIR—Dizziness is one of the commonest symptoms described by older people [1] and is associated with balance disorders, functional decline, reduction in quality of life and falls [2–4]. At least 50% of older people with dizziness complain of two different dizzy symptoms; the most common being a gait disorder (a feeling of disequilibrium on walking) [5], and the other arising from the cardiovascular and peripheral vestibular systems [6]. Dizziness and balance disorders in older people are common presenting symptoms at Falls clinics.

‘Positional vertigo’ (brief episodes of vertigo with nystagmus provoked by changes in head position) is one of the most common symptoms [7] presented to an ear, nose and throat (ENT) service. Benign paroxysmal positional vertigo (BPPV) accounts for the great majority of these cases and is caused by peripheral vestibular rather than central pathology [8]. Posterior canal benign paroxysmal positional vertigo (p-BPPV) is the commonest type of positional vertigo seen and is treatable [9].


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Research letters
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Prevalence of BPPV increases with age [7] and in one study on medical outpatients with unrecognised BPPV, it has been found to be associated with a history of falls [10]. Older adults with BPPV are more likely to present to falls services managed by geriatricians rather than an ENT department as they frequently describe postural ‘dizziness’ rather than vertigo and have multiple types of dizziness [11].

The aim of this study is to identify (i) patients presented to a Falls and Syncope Service (FSS) with positional vertigo and nystagmus and (ii) compare and contrast the prevalence of falls within that group to those presenting with other dizzy symptoms to a Falls and Syncope Unit.

Methods

The FSS based in Newcastle serves over 1,500 new patients annually, with one third describing dizziness alone or dizziness in combination with symptoms of falls and/or syncope. There is a separate, regional ENT service in Newcastle offering diagnostic and treatment service for vertigo and is available for all ages.

We identified consecutive patients seen in FSS by a single observer over a 2-year period between January 2005 and 2007. These patients were referred to FSS with dizziness as the main presenting complaint. Types of dizziness included presyncope, unsteadiness, light-headedness and non-specific dizziness.

Standardised assessment was performed in each individual and is described in Figure 1. Gait disorders were categorised using the Nutt classification [12].

Diagnosis of benign paroxysmal positional vertigo (BPPV)

Diagnosis of BPPV was made when typical signs (nystagmus) and symptoms (vertigo) are provoked by positional tests such as the Dix–Hallpike test or side-lying test [13]. The diagnosis of p-BPPV, the most common type of BPPV, was made when there was positional nystagmus with torsional and vertical components appearing when the patient was positioned to the symptomatic side [7].

Diagnosis of central positional nystagmus (CPN)

Positional vertigo arising from central pathology is less common and is suspected when clinical features differed from BPPV, e.g. latency, duration and particularly the direction of nystagmus, and if additional neurological signs were present [14].

Positional vertigo with nystagmus versus all other types of dizziness

Those with positional vertigo along with nystagmus (PN group) from either BPPV or central positional nystagmus (CPN) were compared to a group of consecutive dizzy patients assessed using the same standardised criteria by one observer but found not to have PN (non-PN group).

Analysis

Comparisons between groups were done using parametric tests for continuous variables, unpaired t-tests and Fishers exact test for proportions. A statistically significant result was when \( P < 0.05 \).

Results

Over a 2-year period, 850 patients complaining of dizziness were included. Median duration of dizzy symptoms was 12 months (range 3–144). A total of 123 (14.5%) subjects had positional nystagmus (PN) on Dix–Hallpike or side-lying test (the PN group). Mean (range) age of the PN group was 71 years (36–94) with 86 (70%) females and were comparable to the non-PN group, with mean (range) age of 64 years (26–91) with 72% females (\( P = \text{ns} \)).

Diagnosis of positional nystagmus

In 103 (84%) patients, the positional test used for diagnosis was the Dix–Hallpike test. This test was not suitable (because of limitations in cervical spine movement) in the remaining 20 (16%) where the side-lying test was used.

One hundred and ten subjects (89%) of the PN group had nystagmus characteristic of p-BPPV. In 63 (51%) the diagnosis was made for right p-BPPV and in 40 (32%) for left p-BPPV, with 7 (6%) having bilateral p-BPPV. Thirteen (11%) subjects had nystagmus on positional testing which was asymptomatic and characteristic of a central vestibular cause.

There were no differences between these phenotypes in age, duration of symptoms or presence of additional gait abnormality or cardiovascular type of dizziness.

Prevalence of injuries in those presenting with positional nystagmus

Fifty-three (44%) subjects in the PN group had fallen compared to 28% of the non-PN group (\( P = 0.04 \)). Fallers were significantly older than non-fallers (\( P = 0.01 \)). When the entire cohort of PN subjects was separated into the younger group (aged 30–49), the middle aged (aged 50–59) and older group (older than 70 years), no differences were found in the proportion who were males, duration of symptoms, the position in which nystagmus was induced, prevalence of gait abnormality and concomitant cardiovascular diagnosis. Falls were, however, significantly more frequently reported in the older age groups (\( P = 0.001 \) (Table 1). Although fallers in our PN cohort were not significantly more likely to have a gait abnormality, there was a trend for it to be more prevalent with increasing age. Details of the injuries sustained by fallers are presented in Appendix 2 in the supplementary data on the journal website (http://www.ageing.oxfordjournals.org).
Falls Service referral with dizziness

- Detailed History & description of all types of dizzy symptoms using an integrated care pathway (www.nelh.org) and examination including lying and standing blood pressure

  - Head movement provoked dizziness suggestive of positional vertigo e.g. with neck extension or lying flat
  - Significant dizziness with postural change
  - History of falls with postural change or neck extension
  - Observed severe short lived dizziness noted during measurement of orthostatic blood pressures without significant orthostatic hypotension
  - Dizzy lying flat

Dix-Hallpike or Side-lying Test

Peripheral : BPPV of semicircular canal origin:
  - p-BPPV

  - Characteristic short < 1 minute
  - Upbeat, torsional nystagmus to side of testing
  - Short lived vertigo

Central positional vertigo

  - Sustained nystagmus without latency
downbeat or torsional or upbeat.
  - Asymptomatic or mild positional vertigo
  - Review if any neurological signs

Figure 1. Schematic representation of the investigation and management of patients attending our falls and syncope clinic with dizziness.

The presence of coexisting cardiovascular diagnoses in those with positional nystagmus

Thirty (24%) of 123 patients in the PN group had an additional cardiovascular type of dizziness. Routine cardiovascular investigations confirmed Vasovagal syncope in 10, orthostatic hypotension in 6, both in 2, bradyarrhythmias in 3 and probable cardiac arrhythmias in 3 with implantable loop recorders now in situ. (Table 1)

The presence of gait abnormalities in those with positional nystagmus

Fifty-nine (48%) patients complained of disequilibrium and had a gait disorder in addition to PN. This was felt to be of lower level gait type in 33, of middle level type in 24 [cerebellar (4) and strokes (5)] and 2 with a high-level gait disorder. All subjects with a significant gait disorder were offered balance rehabilitation.

Management of positional nystagmus

All 110 patients with p-BPPV were offered Epley manoeuvre but this was difficult in 32 (29%) because of co-morbidity including arthritis of cervical spine, shoulder problems and significant frailty. In those with central nystagmus, no diagnosis has ultimately been made to account for the presence of positional nystagmus in 5 (39%), and other diagnoses are shown in Appendix 3 in the supplementary data on the journal website (http://www.ageing.oxfordjournals.org).

Discussion

A study from medical out-patients [10] suggested that individuals with undiagnosed BPPV reported more falls than those without BPPV. The current study, performed in a falls service, confirms that those with positional nystagmus are more likely to fall than those with other types of dizziness and the oldest patients with PN are
more likely to sustain significant injuries than younger patients. In our study, 38% of those with PN fell as a direct consequence of BPPV describing falls precipitated by looking up, bending over or with postural change. Half of those with BPPV in community studies complain of a sensation of imbalance seemingly unrelated to any precipitating head movements [15] and show impairments in balance testing [16], a difference more pronounced in older patients [17].

Our results confirm previous studies that p-BPPV is the commonest cause of positional nystagmus [8]. Horizontal and anterior canal BPPV are rarer; we saw neither of these subtypes in this large series presented to a falls service.

In this series it is important to note that patients with CPN, although less common (11% of the total group), can be presented to a falls unit rather than directly to neurology services. This prevalence is similar to the 12% seen in the series from an otolaryngology clinic [18]. Sustained, downbeat nystagmus appears to be the most frequent type of CPN seen [14]. This was the commonest diagnosis made in our central group and was associated with cerebellar pathology. This underlines the importance of ensuring appropriate training of clinicians working in falls units who must have skills to differentiate types of nystagmus.

BPPV leads to significant morbidity, psychological impact and medical costs in all age groups [15] and health-related quality of life in elderly patients [19]. Dix-Hallpike test and side-lying test are validated as cost-effective tests for the diagnosis of BPPV [13, 20]. There were no complications in performing these tests in more than 500 older patients in a falls unit.

This study shows that half of all the patients presented with positional nystagmus to a falls unit also had other types of dizziness requiring specific investigation and management. This suggests that older patients with dizziness may require a comprehensive service perhaps based in a falls unit, which should include expertise in diagnosing and treating BPPV as well as access to cardiovascular testing and accurate diagnosis and rehabilitation of gait disorders.

### Key points
- Dizziness in older persons is a common presentation to a falls service.
- Older persons with BPPV are more likely to fall than with any other type of dizziness.
- BPPV is a treatable risk factor for falls.
- Older persons have multiple types of dizziness requiring a structured, comprehensive assessment which should include positional testing for BPPV.

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There was no conflict of interest or funding given to support this research.

### Supplementary data

Supplementary data for this article is available online at http://ageing.oxfordjournals.org.

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### References

Contribute to these changes. A study of grip strength in linked to lower strength [8, 9], but these studies have not der, size and physical activity [5–7]. Older age has been healthy ageing [1–4]. Reported influences include age, gen-

Sir—Maintenance of muscle strength and physical performance in later life is an important component of healthy ageing [1–4]. Reported influences include age, gender, size and physical activity [5–7]. Older age has been linked to lower strength [8, 9], but these studies have not considered how age-related decline in activity levels may contribute to these changes. A study of grip strength in older people found that it declined by 20% per decade but only 11% of this decline could be attributed to age alone [10].

Older people are encouraged to maintain levels of physical activity, but most evidence considers the benefits of exercise and strength training intervention programmes [11–13]. It is important to quantify activity levels corresponding to levels of benefit in general, as well as defining specific outcomes related to particular activities in both men and women. Epidemiological studies suggest that increased customary physical activity is associated with improved muscle strength and physical performance, but it is unclear whether men and women derive similar benefit [14–17]. For example Bassey et al. found a positive association between usual physical activity and muscle strength in both men and women [18], whereas Rantanen’s study of everyday physical activity in older people showed the importance of activities such as housework, walking and gardening in maintaining independence for women [19].

The objective of this study was to investigate the relationship between customary physical activity, muscle strength and physical performance in older men and women.

Methods

This study was based on the previously described Hertfordshire Cohort Study [20]. We received general practitioner permission to contact 647 women and 792 men resident in West Hertfordshire. A total of 321 (50%) women and 396 (50%) men agreed to a home interview, and 280 (87%) women and 349 (88%) men subsequently attended a clinic for investigations including anthropometry [21], hand grip strength using a Jamar dynamometer (Promedics, Blackburn, UK) [22] and a short physical performance battery [23] (comprising tests of 3 m customary walking pace, 5 sit-stand chair rises time and timed one-legged balance). In addition, 275 women and 229 men completed a 69-item validated self-administered questionnaire [Hertfordshire Physical Activity Questionnaire (HPAQ)] based on the Minnesota instrument which assessed activity over the previous 12 months [24, 25]. Respondents indicated whether they participated in each activity (yes/no), and if yes, ticked the months during which they did it and gave the typical duration of time spent doing it (in hours and minutes). Intra- and interobserver variability studies were carried out for all physical performance measures at regular intervals during the fieldwork to ensure comparability of measurements within and between observers. In all cases, the fieldwork team measured similarly to one another and repeatably within themselves. The study had ethical approval from the Hertfordshire and Bedfordshire Local Research Ethics Committee, and participants gave written informed consent.

Relationship between customary physical activity, muscle strength and physical performance in older men and women: findings from the Hertfordshire Cohort Study

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