Use of oral corticosteroids in the community and the prevention of secondary osteoporosis: a cross sectional study

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Abstract

***Objective*—To determine the prevalence of continuous use of oral steroids in the general population, the conditions for which they are prescribed, and the extent to which patients taking oral steroids are taking treatment to prevent osteoporosis.**

***Design*—A cross sectional study with a four year retrospective review of drug treatment.**

***Setting*—Eight large general practices in central and southern Nottinghamshire.**

***Subjects*—A population of 65 786 patients (52% women) registered with a general practitioner during 1995.**

***Results*—303 patients (65% (197) women) aged 12-94 years were currently taking "continuous" (for at least three months) oral corticosteroid treatment. This figure represents 0.5% of the total population and 1.4% (245/17 114) of patients aged 55 years or more (1.7% (166/9601) of women). The usual steroid was prednisolone (97% (294/303)), the mean dose was 8.0 mg/day, and the median duration of oral steroid treatment determined in 149 patients was three years. The most common conditions for which continuous oral steroids were prescribed were rheumatoid arthritis (23% (70)), polymyalgia rheumatica (22% (66)), and asthma or chronic obstructive airways disease (19% (59)). Only 41 (14%) of the 303 patients taking oral steroids had received treatment for the prevention of osteoporosis over the past four years. Although 37 of the 41 patients were women, only 10% (18/181) of the women over 45 years taking continuous oral corticosteroids were currently taking hormone replacement therapy.**

***Conclusions*—If our figures are typical then they suggest that over 250 000 people in the United Kingdom are taking continuous oral steroids and that most of these are taking no prophylaxis against osteoporosis.**

Introduction

Oral corticosteroids have a major and often essential role in the treatment of several diseases. The cost of long term treatment in terms of side effects such as skin changes, truncal obesity, diabetes, hypertension, and osteoporosis can, however, be large. Little can be done to prevent or treat some of these adverse effects, whereas others—such as osteoporosis—may be amenable to prevention.

Osteoporosis constitutes a major public health problem through its association with fractures, the annual cost of which has been estimated at £614m for England and Wales.[1] Although osteoporosis is inextricably associated with aging, any measure that alters the risk of osteoporosis has large public health implications. As established osteoporosis is difficult to treat, the aim should be prevention, including the identification and prevention of secondary causes. Steroid treatment is the commonest cause of osteoporosis and accounted for more than half the osteoporosis identified in young people in one study.[2] Over 5.5 million prescriptions for systemic corticosteroids were issued by general practitioners in the United Kingdom in 1993,[3] but no information exists on how these were prescribed. We carried out a community survey in Nottinghamshire to determine the prevalence of continuous use of oral steroids, the conditions for which they were prescribed, and the concurrent use of treatment to prevent osteoporosis.

Methods

The four year survey covered a population of 65 786 in eight general practices in central and southern Nottinghamshire. We initially approached practices that fulfilled two requirements—more than 5000 patients in the practice and computerised medical records—having obtained this information from the Nottingham Family Health Services Authority. We sent a letter to the 46 practices that fulfilled these requirements, inviting them to participate in the study and giving details of our computer requirements. Eight practices with computerised patient records for at least four years agreed to participate; two practices were rural, one was in the inner city, and five were in suburban Nottingham.

Patients currently registered with the practice who had received an oral corticosteroid within the previous year were identified from a computer search of practice records. Each patient's computer record was then reviewed by a medically qualified person to document the patient's details; the dose, duration, and type of oral steroid treatment; the condition for which the steroids were required; and the use of hormone replacement therapy or other bone modifying treatment during the study period. In six of the practices the computer record included the patient's history, details of all drugs prescribed over the preceding four years, and major diagnoses before the computer record; in the other two practices the computer contained a full drug record for at least three years with more limited patient information. In these two practices and in two of the six with complete records the written record was also reviewed so that we had complete data for four years from all practices. It also allowed us to determine the duration of oral steroid treatment in these four practices. Paper records were also reviewed for new patients who had computerised records for less than four years and whenever there was uncertainty with the computer record.

A history of current oral corticosteroid treatment of at least three months' duration was defined as "continuous treatment." The median dose for all subjects was determined from individual mean doses during the four years. The diagnoses of asthma and chronic obstructive pulmonary disease were amalgamated as it was sometimes difficult to separate the two. The study was given ethical approval by Nottingham City Hospital's ethics committee and was approved by Nottingham Family Health Services Authority. Descriptive data were obtained with SPSS/PC+ 4.0 statistical package (SPSS, Chicago, Illinois).

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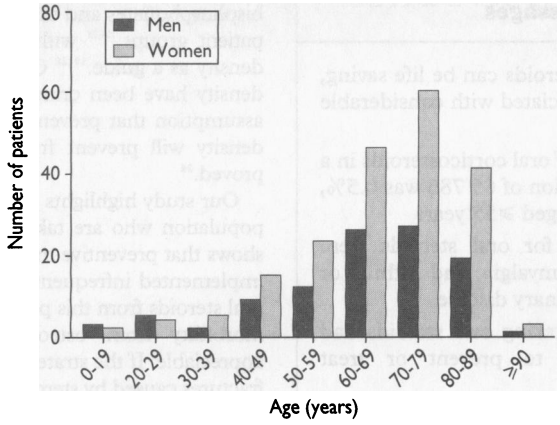

Fig 1—*Age-sex distribution of patients taking continuous oral corticosteroids*

Results

From a total population of 65 786 (52% women) covered by the eight practices, 303 patients (0.5%) were currently taking continuous oral corticosteroid treatment, of whom 65% (197) were women. The age range of those taking continuous treatment was 12-94 (median 69) years (fig 1). Of the population aged 55 years or more, 1.4% (245/17 114; 1.73% (166/9601) of women) were currently taking continuous oral steroids. The most commonly prescribed steroid was prednisolone (in 97% (294/303) of cases), with a mean dose of 8.0 mg/day (median 6.8 mg/day). The most common conditions requiring continuous oral steroid treatment were rheumatoid arthritis (23%), polymyalgia rheumatica (22%), and asthma or chronic obstructive pulmonary disease (19%) (table 1). In the four practices in which the written record was reviewed (149 patients) the median duration of continuous oral steroid treatment was three (range 0.3-37) years; 22 patients had received oral steroids for over 10 years and eight patients for over 20 years (fig 2).

Only 41 patients (37 women) had received treatment for the prevention of osteoporosis over the past four years. Treatment comprised hormone replacement therapy (24 patients); calcium alone (7) or with vitamin D (6) or bisphosphonates (3); and vitamin D alone (1). Only 10% (18/181) of women aged over 45 years taking continuous oral steroids were currently taking hormone replacement therapy. A further 3% (6/18) had taken hormone replacement therapy during the four years but were not taking it at the time of the survey.

Table 1—*Conditions for which oral steroids were prescribed in 303 patients**

Condition	No of patients
Rheumatoid arthritis	70
Polymyalgia rheumatica	66
Asthma or chronic obstructive airways disease	59
Temporal arteritis	17
Ulcerative colitis	10
Transplant surgery	9
Systemic sclerosis	8
Fibrosing alveolitis	6
Myasthenia gravis	6
Crohn's disease	5
Chronic hepatitis	4
Pemphigoid	4
Neoplasia	4
Conjunctival or eye condition	4
Eczema or skin ulcer	3
Glomerulonephritis	3

*The list includes all conditions for which at least three patients had been prescribed an oral steroid. Of the remaining 25 patients, two were taking oral steroids for each of the following conditions—sarcoidosis, dermatomyositis or polymyositis, inflammatory polyarthropathy, panhypopituitarism, Addison's disease, and multiple sclerosis—and single patients were taking oral steroids for rare conditions, such as polyarteritis nodosa.

Discussion

This is the first reported survey of the prevalence of use of oral corticosteroids in a community population. The practices covered urban and rural areas and seemed to provide a representative sample of the local population as they were sited in areas with Townsend scores ranging from −4.5 at the affluent end of the scale to 11.6 at the deprived end, with a median value of 1.3.[4] (The Townsend scores in Nottinghamshire range from −7.3 to 11.6.) Many of the patients in the survey were attending hospital outpatient clinics, and the findings therefore reflect prescribing practice in primary and secondary care.

Every effort was made to ensure that all patients were identified in the initial computer search, and in the two fully computerised practices in which computerised and written records were compared there were only minor discrepancies in patient information, such as an occasional missing record of a home visit. The computerised record usually contained more information on drug treatment as repeat prescriptions are often not reported in written records. Most prescribing for acute conditions was documented, and, although a course of steroids may occasionally have been omitted, this would be unlikely to affect the detection of continuous use of oral steroids.

The figure of at least three months was chosen as the defining duration for "continuous treatment" in order to exclude discrete courses of steroids, which rarely last more than four to six weeks. Our figures will underestimate the total use of oral steroids as some patients, particularly those with asthma and chronic obstructive pulmonary disease, had intermittent courses of oral prednisolone rather than continuous treatment. Two thirds of continuous use of oral steroids was accounted for by rheumatoid arthritis, polymyalgia rheumatica, and asthma or chronic obstructive pulmonary disease. Our data do not allow us to determine whether oral steroids were being used appropriately, although we know that 85% of the patients with asthma or chronic obstructive pulmonary disease were also taking an inhaled corticosteroid.

OSTEOPOROSIS INDUCED BY STEROIDS: THE SIZE OF THE PROBLEM

Extrapolation of our figures to the population of the United Kingdom (55.5 million in 1992) suggests that just over a quarter of a million people are currently taking continuous oral corticosteroids. This figure is likely

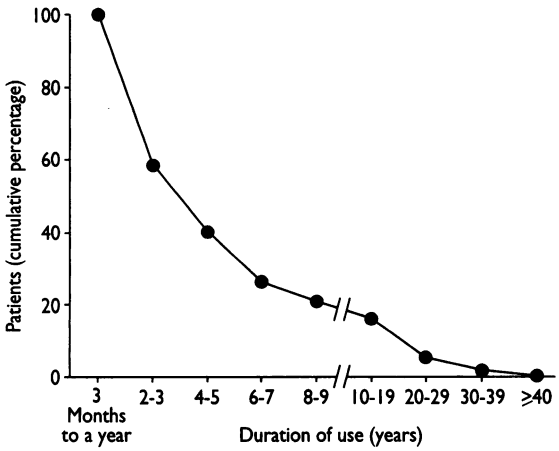

Fig 2—*Duration of oral corticosteroid treatment. Data are expressed as cumulative percentage of patients taking oral steroid treatment against time*

Key messages

- Although oral corticosteroids can be life saving, their long term use is associated with considerable morbidity
- The prevalence of use of oral corticosteroids in a community based population of 65 786 was 0.5%, rising to 1.7% in women aged ≥55 years
- The main indications for oral steroids were rheumatoid arthritis, polymyalgia, and asthma or chronic obstructive pulmonary disease
- Only 14% of patients taking oral steroids had received any treatment to prevent or treat osteoporosis
- These data suggest that over a quarter of a million people in the United Kingdom are currently taking oral corticosteroids and hence at risk of adverse effects

to increase as the elderly population increases, and data from the Prescription Pricing Authority support this, showing a 26% increase in prescriptions for oral steroids in Nottinghamshire between 1990 and 1995.

The magnitude of the increased risk of fracture associated with oral steroids in relation to dose and duration of treatment is still uncertain. However, one study showed that patients taking corticosteroids had approximately twice the risk of hip fracture as those who were not taking steroids[5]; another study of postmenopausal women with rheumatoid arthritis showed that those taking oral steroids had a four times higher risk for all fractures than those who did not.[6] Vertebral fractures are probably the largest problem arising from corticosteroid treatment, and in a case note review 11% of 128 patients with asthma over the age of 40 taking oral steroids had had a vertebral or rib fracture, compared with none in a control group[7]; the difference was even greater in a small prospective study carried out by the same authors.[7] As fracture constitutes a major public health problem, this sizeable group of patients taking oral steroids is likely to be making an important contribution to the current burden of fracture related to osteoporosis, and this seems likely to increase in the future.

PREVENTION OF OSTEOPOROSIS

It is perhaps surprising that only 14% of the patients taking oral steroids had received any drug treatment in the past four years for the prevention of osteoporosis and that only 10% of women over the age of 45 taking oral steroids were currently taking hormone replacement therapy. The figure of 10% is similar to the figure for women over the age of 45 years in the general population mentioned in the discussion by Isaacs *et al.*[8] The proportion of patients who had received advice on diet and exercise to help prevent osteoporosis is uncertain as advice would not necessarily have been recorded. The mechanism of "steroid induced" osteoporosis differs in some respects from that of involutional osteoporosis, and fractures may occur at higher values of bone mineral density.[9] Less is known about the value of preventive treatment, although recent studies in patients taking or starting to take oral steroids have shown an increase in bone mineral density after several treatments to prevent osteoporosis when compared with no treatment or calcium alone. These treatments include bisphosphonates given alone[10-13] and with ergocalciferol[14] or calcitonin,[15,16] hormone replacement therapy in postmenopausal women,[17] and more arguably calcitriol.[18,19] Although some of these studies were small and of short duration, the recommendation of experts, including a United Kingdom consensus group in 1995,[20] is that hormone replacement therapy should be considered for postmenopausal women taking oral steroids and that bisphosphonates and calcitriol should be considered in all patient groups,[19-23] with measurements of bone mineral density as a guide.[19,20] Guidelines based on bone mineral density have been criticised, however, as the underlying assumption that preventing a reduction in bone mineral density will prevent fractures in the future is not yet proved.[24]

Our study highlights the large number of people in the population who are taking continuous oral steroids and shows that preventive measures for osteoporosis are being implemented infrequently. The extent of morbidity from oral steroids from this population is unknown, though the morbidity from osteoporosis alone is likely to be appreciable. If the strategies recommended for preventing fractures caused by steroid induced osteoporosis are effective the number of patients who stand to benefit is large.

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1 Kanis JA. The incidence of hip fracture in Europe. *Osteoporosis Int* 1993;1(suppl):S10-5.
2 Khosla S, Lufkin EG, Hodgson SF, Fitzpatrick LA, Melton LJ, III. Epidemiology and clinical features of osteoporosis in young individuals. *Bone* 1994;15:551-5.
3 Rice P, Simmons K, Carr R, Banatvala J. Near fatal chickenpox during prednisolone treatment. *BMJ* 1994;309:1069-70.
4 Wilson, S. *Aiming for health in the year 2000: the annual report of the director of public health 1995.* Nottingham: Nottingham Health District, 1995.
5 Cooper C, Coupland C, Mitchell M. Rheumatoid arthritis, corticosteroid therapy and hip fracture. *Ann Rheum Dis* 1995;54:49-52.
6 Verstraeten A, Dequeker J. Vertebral and peripheral bone mineral content and fracture incidence in postmenopausal patients with rheumatoid arthritis: effect of low dose corticosteroids. *Ann Rheum Dis* 1986;45:852-7.
7 Adinoff AD, Hollister JR. Steroid-induced fractures and bone loss in patients with asthma. *N Engl J Med* 1983;309:265-8.
8 Isaacs AJ, Britton AR, McPherson K. Utilisation of hormone replacement therapy by women doctors. *BMJ* 1995;311:1399-401.
9 Luengo M, Picado C, Del Rio L, Guañabens N, Montserrat JM, Setoain J. Vertebral fractures in steroid dependent asthma and involutional osteoporosis: a comparative study. *Thorax* 1991;46:803-6.
10 Reid IR, King AR, Alexander CJ, Ibbertson HK. Prevention of steroid-induced osteoporosis with (3-amino-1-hydroxypropylidene)-1,1-bisphosphonate (APD). *Lancet* 1988;i:143-6.
11 Reid IR, Heap SW, King AR, Ibbertson HK. Two year follow-up of bisphosphonate (APD) treatment in steroid osteoporosis [letter]. *Lancet* 1988;ii:1144.
12 Adachi JD, Cranney A, Goldsmith CH, Bensen WG, Bianchi F, Cividino A, *et al.* Intermittent cyclic therapy with etidronate in the prevention of corticosteroid induced bone loss. *J Rheumatol* 1994;21:1922-6.
13 Mulder H, Struys A. Intermittent cyclical etidronate in the prevention of corticosteroid-induced bone loss. *Br J Rheumatol* 1994;33:348-50.
14 Diamond T, McGuigan L, Barbagallo S, Bryant C. Cyclical etidronate plus ergocalciferol prevents glucocorticoid-induced bone loss in postmenopausal women. *Am J Med* 1995;98:459-63.
15 Luengo M, Picado C, Del Rio L, Guanabens N, Montserrat JM, Setoain J. Treatment of steroid-induced osteopenia with calcitonin in corticosteroid-dependent asthma. A one-year follow-up study. *Am Rev Respir Dis* 1990;142:104-7.
16 Luengo M, Pons F, Martinez de Osaba MJ, Picado C. Prevention of further bone mass loss by nasal calcitonin in patients on long term glucocorticoid therapy for asthma: a two year follow up study. *Thorax* 1994;49:1099-102.
17 Lukert BP, Johnson BE, Robinson RG. Estrogen and progesterone replacement therapy reduces glucocorticoid-induced bone loss. *J Bone Miner Res* 1992;7:1063-9.
18 Sambrook P, Birmingham J, Kelly P, Kempler S, Nguyen T, Pocock N, *et al.* Prevention of corticosteroid osteoporosis. A comparison of calcium, calcitrol and calcitonin. *N Engl J Med* 1993;328:1747-52.
19 Lukert BP, Raisz LG. Glucocorticoid-induced osteoporosis: pathogenesis and management. *Ann Intern Med* 1990;112:352-64.
20 Eastell R. Management of corticosteroid-induced osteoporosis. *J Intern Med* 1995;237:439-47.
21 Reid IR. Pathogenesis and treatment of steroid osteoporosis. *Clin Endocrinol* 1989;30:83-103.
22 Lukert BP. Glucocorticoid-induced bone loss: a neglected problem. *Chest* 1994;105:1640-1.
23 Spector TD, Sambrook PN. Steroid osteoporosis. *BMJ* 1993;307:519-20.
24 Sheldon TA, Raffle A, Watt I. Why the report of the Advisory Group on Osteoporosis undermines evidence based purchasing. *BMJ* 1996; 312:296-7.

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