

# Frozen shoulder and other shoulder disturbances in Parkinson's disease

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**SUMMARY** The frequency of shoulder disturbances, particularly frozen shoulder, has not been assessed previously in Parkinson's disease. In a survey of 150 patients compared with 60 matched control subjects a significantly higher incidence of both a history of shoulder complaints (43% vs. 23%) and frozen shoulder (12.7% vs. 1.7%) was found in the Parkinson's disease population. Those developing a frozen shoulder had initial disease symptoms indicative of akinesia twice as frequently as tremor while the ratio was reversed in those without frozen shoulder. In at least 8% of the patients frozen shoulder was the first symptom of disease, occurring 0–2 years prior to the onset of more commonly recognised features. Parkinson's disease should be added to the list of causes of frozen shoulder, and clinicians must be aware that the latter is often the presenting symptom of Parkinson's disease.

The occurrence of shoulder joint abnormalities has not, to our knowledge, been studied in the setting of Parkinson's disease. Although it seems intuitive that immobilised patients in the later stages of their illness might have a high incidence of shoulder disturbances, we have been impressed that a number of our patients have experienced difficulties before other features of Parkinson's disease were recognised. A systematic survey was undertaken to determine how important a problem this was in the Parkinson's disease population. The incidence of complaints related to the shoulder joints in a consecutive series of patients was examined, with specific interest in determining the frequency of frozen shoulder and the relation between its development and the timing and nature of the onset of Parkinson's disease.

## Patients and methods

We surveyed 150 consecutive patients with Parkinson's disease. Patients with other recognised causes of Parkinsonism (neuroleptic drugs, progressive supranuclear palsy, multiple system atrophy, etc.) were excluded. Parkinson's disease patients were excluded from the series only if dementia or incompatibility of language prevented reliable communication. The following information was recorded for each patient: age, sex, age at onset and duration of symptoms, and nature and distribution of initial symptoms. The current medications and response to treatment, including side effects, were also noted. The current status was assessed by means of the Unified Parkinson's Disease Rating Scale (UPDRS),<sup>1</sup>

Hoehn and Yahr staging,<sup>12</sup> and the Schwab and England activities of daily living scale (ADLS).<sup>13</sup> An attempt was made to classify the patients, according to their current symptoms and signs, as predominantly tremulous or akinetic and rigid, or a relatively equal combination of the two.

Patients were asked if they had experienced any problems with either or both shoulders at any time in their life, including before, while and since developing their initial symptoms of Parkinson's disease. If the answer was affirmative, patients were requested to describe the difficulty in their own words. Patients were questioned whether they had sought a medical opinion regarding their complaints, and, if so, what diagnosis was given and what treatment was instituted. Whenever possible, this information was verified by the use of available medical records. We accepted the diagnosis of frozen shoulder only if patients gave a history of spontaneous onset of painful and progressively severe restriction of shoulder joint mobility, lasting for a variable period measurable in months and followed by gradual resolution, with or without medical intervention, with no evidence for intrinsic shoulder joint pathology. Patients were also asked about a previous history of known predisposing factors for frozen shoulder<sup>4–6</sup> including myocardial infarction, stroke, chronic lung disease, diabetes mellitus, trauma, rheumatoid arthritis, cervical spine disease, subphrenic abscess, cancer, or any other possible cause of prolonged shoulder immobility.

We also surveyed a group of 60 persons without Parkinson's disease (controls), comparable in age and sex to our patients (table 1), for a history of any type of shoulder problems. This group consisted of adults randomly distributed among the hospital population including patients, staff and visitors. Patients were excluded if their current admission was related to any of the conditions mentioned above which are known to predispose to frozen shoulder. Statistical analysis was performed using the Student's *t* test or the chi-square method, where applicable.

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Table 1 *Patients and controls*

	Patients	Controls	p
Number surveyed	150	60	—
Mean age (range)	63.7 yr (34–83)	63.6 yr (37–86)	NS
Sex (M:F)	87:63	34:26	NS

NS = not significant

## Results

The mean age at onset of Parkinson's disease in our patients was 56.9 years and the mean duration of disease was 7.6 years (table 2). Although 90% of patients had presented with a single symptom, usually isolated to one limb, at the time of study the majority suffered to a somewhat similar degree from both tremor and akinesia (table 2). Twenty-six patients had never received pharmacotherapy for their Parkinson's disease. Of the remainder, 116 patients had been given dopamine agonists (levodopa preparations, bromocriptine and/or pergolide) and all but one of these remained on dopamine agonist therapy for a mean of 6.0 years.

Sixty-five of the 150 patients gave a history of some shoulder disturbance in the past or present while 85 had never had complaints referable to their shoulder joints (table 3). Nineteen patients had experienced various forms of trauma to one shoulder; none of these had had a frozen shoulder. Four had suffered fractures (bone unspecified), three had dislocated their shoulder, and 12 had had various soft tissue injuries. There was no consistent relationship between the location or timing of the trauma and the onset, location or nature of the symptoms of Parkinson's disease.

Sixteen patients with a history satisfying our diagnostic criteria had previously been diagnosed as having a frozen shoulder at some time. Thirteen other

Table 2 *Onset and current status of Parkinson's disease*

	Patients	Controls	p
Mean age at onset (range)	56.9 years (27–80)		
Initial symptoms			
Tremor		82	
Unilateral	79		
Bilateral	3		
Akinesia (slowness/stiffness/clumsiness)		53	
Unilateral	40		
Bilateral	13		
Simultaneous tremor and akinesia		12	
Unilateral	12		
Other		3	
Neck stiffness	1		
Left arm "numbness"	1		
Hypophonia, drooling	1		
Mean duration of Parkinson's disease (range)	7.6 years (5 mos.–26 yrs)		
Current Parkinson's disease classification			
Predominantly tremor		26	
Predominantly akinesia and rigidity		42	
Combined		82	

Table 3 *Shoulder problems in Parkinson's disease and controls*

	Parkinson's disease	Controls	p
Total	150	60	—
Positive history of shoulder problems	65	14	<0.01
Frozen shoulder	19	1*	<0.02
Other spontaneous pain and restricted movement	10	0	<0.05
Restriction of movement without pain	3	1	NS
Pain without restriction of movement	13	4	NS
Off-period pain	1	—	—
Pain with symptoms of C7 radiculopathy	0	1	—
Trauma	19	7	NS

\* = see text for details

patients gave a history of the spontaneous onset of pain and restricted movement about the shoulder; in three of these cases the history was so distinctive that it was possible to make the diagnosis of frozen shoulder in retrospect. All three had sought a medical opinion; two could not recall the diagnosis and the other believed he was told he had arthritis by his family physician, although no investigations were undertaken and there had been no recurrence of symptoms in the intervening 9 years. In 10 other patients the history suggested a similar occurrence but missing or atypical details prevented making the diagnosis with complete confidence.

The peak occurrence of frozen shoulder was during the 2 years prior to the onset of Parkinson's disease symptoms (table 4). In almost all cases the initial symptoms of Parkinson's disease developed in the upper limb ipsilateral to the frozen shoulder. Among

Table 4 *Frozen shoulder and Parkinson's disease (19 pts)*

	Frozen shoulder	Non-frozen shoulder	p
<i>(A) Temporal relationship</i>			
<i>Onset of frozen shoulder</i>			
> 24 mos before onset of Parkinson's disease		2	
13–24 mos before onset of Parkinson's disease		4	
1–12 mos before onset of Parkinson's disease		7	
Simultaneous with onset of Parkinson's disease		1	
After onset of Parkinson's disease (1–3 yrs)		5	
<i>(B) Spatial relationship</i>			
<i>Initial body part affected by Parkinson's disease</i>			
Upper limb ipsilateral to frozen shoulder		16	
Lower limb contralateral to frozen shoulder		1	
All limbs (generalised)		1	
Single upper limb, bilateral frozen shoulder		1	
<i>(C) Relationship of frozen shoulder to mode of onset of Parkinson's disease</i>			
Initial symptom	Frozen shoulder	Non-frozen shoulder	p
Akinesia	12	41	<0.05
Tremor	6	76	<0.05
Simultaneous tremor and akinesia	1	11	NS
Other	0	3	—
(Total)	(19)	(131)	—

the frozen shoulder patients akinesia was the first symptom of Parkinson's disease twice as often as was tremor, while the ratio was nearly reversed for Parkinson's disease patients without frozen shoulder. Notably, the presenting complaint of Parkinson's disease was related to akinesia (that is, slowness, loss of dexterity, etc.) in the ipsilateral upper limb in eight of the 12 patients whose initial symptoms of Parkinson's disease developed within 24 months of the onset of frozen shoulder. In one there was simultaneous akinesia and tremor in the ipsilateral upper limb, in another there was generalised akinesia and in the other two the presenting symptom of Parkinson's disease was tremor in the ipsilateral upper limb.

The 19 patients with frozen shoulder (13 male, 6 female) had a mean duration of Parkinson's disease of 5.3 years, while those without frozen shoulder had a mean duration of 7.9 years. Allowing for this discrepancy in considering the occurrence and severity of drug-related complications and progression of disease there were no important differences between the two groups in terms of severity of disease, nature of the response to antiparkinsonian medication, or incidence of problems such as dyskinesias, dystonia, fluctuations and psychiatric disturbances, as recorded on the UPDRS, the Hoehn and Yahr scale and the Schwab and England ADLS.

Of the 10 patients experiencing unexplained episodes of shoulder pain and restriction of mobility, without sufficient information to make a retrospective diagnosis of frozen shoulder, four developed sore, stiff shoulders from 6 months before to synchronously with the onset of Parkinson's disease symptoms. The initial complaints referable to Parkinson's disease in these patients were ipsilateral to the frozen shoulder in three and generalised in the other patient.

Thirteen patients gave a history of various shoulder pains without restriction of movement. One treated patient with pronounced fluctuations in mobility complained of pain in one shoulder only when the Parkinsonian symptoms were at their maximum (that is, during "off" periods). Three patients described painless restriction of movement about the shoulder.

None of the control population had previously been diagnosed as having frozen shoulder. However, of great interest was one 57 year old man, who had suffered the spontaneous onset of pain and progressive restriction of shoulder movement 7 to 8 months earlier. On examination there was diffuse tenderness about the shoulder joint and restriction of both active and passive extension and abduction, although not in other directions. We have conservatively listed him as having frozen shoulder. On further questioning and examination he complained of stiffness of the ipsilateral arm and leg for the past year, and demonstrated definite bradykinesia of those limbs, a slight action tremor of the arm but no convincing rigidity.

## Discussion

Frozen shoulder, also known as periarthritis or adhesive capsulitis, is a syndrome consisting of spontaneous onset of pain and progressive restriction of movement in a shoulder, in the absence of any demonstrable intrinsic joint abnormality. The onset is followed by a chronic phase in which the pain recedes but the shoulder immobility remains marked, and finally by gradual spontaneous resolution.<sup>7</sup> The course is highly variable but is usually measured in months<sup>8</sup> to years.<sup>7</sup> Frozen shoulder occurs almost exclusively after the age of 40 years and affects women more often than men.<sup>9</sup> The pathophysiology of frozen shoulder is largely unknown, and usually no precipitating cause is found. However it has been associated with a number of predisposing factors, including myocardial infarction, stroke, chronic lung disease, diabetes mellitus, trauma, rheumatoid arthritis, cervical spine disease, subphrenic abscess and cancer.<sup>4-6</sup> The relationship of frozen shoulder to some of these conditions is obscure, but DePalma<sup>9</sup> has emphasised the critical role of prolonged muscular inactivity about the shoulder.

As a potential source of great immobility Parkinson's disease would seem to be a logical precipitating factor for the development of frozen shoulder, although to our knowledge there has been no previous assessment of this association. We have found that frozen shoulder is indeed a common complication of Parkinson's disease, occurring in 12.7% of our patients. The incidence may actually be higher, but we were unable to be certain of the diagnosis in other patients with suggestive histories. Men were affected out of proportion to their numerical majority in our population, contrary to the predominance of women found in other studies of frozen shoulder.<sup>4,9</sup>

A striking observation which has not been recognised previously is the common occurrence of frozen shoulder as the presenting feature of Parkinson's disease. In our survey, there was a remarkable tendency for the frozen shoulder to occur, not in the later stages (presumably the time of greatest akinesia) but within a year or two prior to the onset of symptoms of Parkinson's disease. None of our patients developed frozen shoulder more than 3 years after the onset of Parkinson's disease. Awareness of the disease and subsequent treatment (physiotherapy, pharmacotherapy) and exercise regimens, at least in a population with a relatively short disease duration as studied here (7.6 years), may lessen the likelihood of developing frozen shoulder.

Patients with frozen shoulder were more likely to have had akinetic symptoms as their first manifestation of Parkinson's disease, whereas the other Parkinson's disease patients were more likely to complain initially of tremor. Because of these factors and the high correlation between the affected shoulder and the

site of onset of Parkinson's disease (84% in the upper limb ipsilateral to the frozen shoulder), we feel that the occurrence of frozen shoulder in Parkinson's disease is related to the incipient development of akinesia in the ipsilateral arm.

By contrast, there was virtually no discrepancy between the patient group and controls in the incidence of trauma to the shoulder or arm. Remote or recent trauma did not appear to predict the site of onset of Parkinson's disease, and the initially affected limb in Parkinson's disease appeared no more vulnerable to subsequent trauma. Schott<sup>10</sup> reported three patients who developed symptoms of Parkinson's disease in a limb within a month of suffering trauma to that extremity. Although none of our patients experienced trauma in such proximity to the onset of Parkinson's disease, patients in our survey with a history of shoulder trauma, whether recent or remote, were just as likely to develop symptoms of Parkinson's disease in the contralateral as the ipsilateral arm. For the reasons previously outlined we believe that the occurrence of frozen shoulder in our patients was secondary to the akinesia of Parkinson's disease rather than a primary or causative event, as Schott suggested was the case for trauma in his patients.

Previous studies of rheumatological or orthopaedic problems in Parkinson's disease have not mentioned frozen shoulder. The most detailed information concerns the occurrence of spinal deformities.<sup>11-13</sup> Grimes *et al*<sup>13</sup> found scoliosis in 60% of their patients, which was unrelated in orientation to the side of onset of Parkinson's disease. Characteristic hand deformities have also been described,<sup>14-16</sup> usually consisting of ulnar deviation at the wrist, flexion at the metacarpophalangeal joints and extension at the interphalangeal joints, sometimes mimicking rheumatoid arthritis. Occasionally these may be related to compressive radial neuropathy.<sup>17</sup> Postural deformities of the foot are also well recognised.<sup>15,18</sup> All of the above may at times be related to dystonic phenomena accompanying Parkinson's disease.

Parkinson's disease should be added to the list of predisposing causes for frozen shoulder, the mechanism likely involving lack of movement about the joint brought on by akinesia. We would emphasise that frozen shoulder should be recognised as a possible presenting feature of Parkinson's disease, as it was in at least 8% of our patients. The occurrence of frozen shoulder as an early sign of Parkinson's disease does not seem to predict or correlate with the subsequent course of the illness, response to pharmacotherapy or complications of treatment. In a patient presenting with frozen shoulder with no obvious precipitating factors we would recommend a careful assessment for further signs of early Parkinsonism, especially bradykinesia. These may be somewhat difficult to detect in the face of pain and restricted shoulder movement, and so the physician should follow the patient with a high index of suspicion for Parkinson's disease.

Interestingly, the only control subject who had features compatible with frozen shoulder may be an example of very early Parkinsonism presenting in this fashion.

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