Knee joint effusion following ipsilateral hip surgery

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ABSTRACT

Purpose. To correlate patellar reflex inhibition with sympathetic knee joint effusion.

Methods. 65 women and 40 men aged 45 to 75 (mean, 65) years underwent hip surgery. The surgery entailed dynamic hip screw fixation using the lateral approach with reflection of the vastus lateralis for per trochantric fractures (n=49), and hip hemiarthroplasty or total hip replacement using the Watson-Jones approach (n=38) or hip hemiarthroplasty using the posterior approach (n=18) for subcapital femoral fractures (n=28) or osteoarthritis (n=28). Knee joint effusion, patellar reflex, and thigh circumference were assessed in both legs before and after surgery (at day 0.5, 2, 7, 14, 30, and 45). Time-sequence plots were used for chronological analysis, and correlation between patellar reflex inhibition and knee joint effusion was tested.

Results. In the time-sequence plot, the peak frequency of patellar reflex inhibition (on day 0.5) preceded that of the knee joint effusion and the thigh circumference increase (on day 2). Patellar reflex inhibition correlated positively with the knee joint effusion (r=0.843, p=0.035). These 2 factors correlated significantly for all 3 surgical approaches (p<0.0005). All 3 approaches were associated with patellar reflex inhibition on day 0.5 (p=0.033) and knee joint effusion on day 2 (p=0.051).

Conclusion. Surgical trauma of the thigh may cause patellar reflex inhibition and subsequently knee joint effusion.

Key words: hip fractures; hip joint; knee joint; osteoarthritis, hip

INTRODUCTION

Symptomatic knee joint effusion is common in elderly patients following ipsilateral hip surgery for fractures or osteoarthritis. Abnormal stress to the knee joint at the time of injury or operation (traction, vibration, and impaction) is one of the aetiological factors.\(^1\,^2\) Experimentally induced knee joint effusion leads to patellar reflex inhibition and neuromuscular...
dysfunction of the quadriceps. Quadriceps dysfunction after surgical trauma may lead to patellar reflex inhibition and knee joint effusion. We recorded the chronology of the above events to determine whether they were correlated.

MATERIALS AND METHODS

Between 2007 and 2008, 65 women and 40 men aged 45 to 75 (mean, 65) years underwent hip surgery. The surgery entailed dynamic hip screw fixation using the lateral approach with reflection of the vastus lateralis for pertrochantric fractures (n=49), and hip hemiarthroplasty or total hip replacement using the Watson-Jones approach (n=38) or hip hemiarthroplasty using the posterior approach (n=18) for subcapital femoral fractures (n=28) or osteoarthritis (n=28). Patients with a knee injury or a history of symptomatic knee osteoarthritis, rheumatoid arthritis or other systemic disease that could impair normal knee joint function were excluded. Bandage or anti-embolic stockingnette was not used after surgery, and all drains were pulled out.

Knee joint effusion (absent or present), patellar reflex (normal, absent or decreased), and thigh circumference (equal, increased or decreased) were assessed in both legs before and after surgery (at day postoperatively.

| Postoperative day | Lateral approach (n=49) | Watson-Jones approach (n=38) | Posterior approach (n=18) |
|-------------------|------------------------|----------------------------|--------------------------|
|                   | Patellar reflex inhibition | Knee joint effusion | Patellar reflex inhibition | Knee joint effusion | Patellar reflex inhibition | Knee joint effusion |
| 0.5               | 47 (96)                | 5 (10)                    | 30 (79)                  | 1 (3)                  | 14 (78)                  | 3 (17)                 |
| 2                 | 47 (96)                | 42 (86)                   | 30 (79)                  | 24 (63)                | 14 (78)                  | 13 (72)                |
| 7                 | 36 (73)                | 31 (63)                   | 13 (34)                  | 10 (26)                | 10 (56)                  | 10 (56)                |
| 14                | 8 (16)                 | 3 (6)                     | 0 (0)                    | 0 (0)                  | 1 (6)                    | 0 (0)                  |
| 30                | 0 (0)                  | 0 (0)                     | 0 (0)                    | 0 (0)                  | 0 (0)                    | 0 (0)                  |
| 45                | 0 (0)                  | 0 (0)                     | 0 (0)                    | 0 (0)                  | 0 (0)                    | 0 (0)                  |

Table
Numbers of patients with patellar reflex inhibition and knee joint effusion postoperatively

Figure
Time-sequence plots showing (a) percentage of patients with knee joint effusion, patellar reflex inhibition, and thigh circumference increase, and (b) changes in percentage of patients with patellar reflex inhibition and subsequent knee joint effusion.
0.5, 2, 7, 14, 30, and 45) by 2 independent observers. The thigh circumference was an indirect indicator of the degree of quadriceps oedema and dysfunction and was measured 12 cm above the upper pole of the patella with the knee in full extension.

The effusions of 10 patients were aspirated for biochemical, histological and microbiological testing.

Time-sequence plots were used for chronological analysis; correlations between patellar reflex inhibition, knee joint effusion, and thigh circumference were tested using the Pearson’s correlation coefficient and the Pearson’s Chi squared test.

RESULTS

Preoperatively, all 77 patients with hip fracture had a mean ipsilateral thigh circumference increase of 1 cm; 11 of them presented with decreased patellar reflex, 9 of whom also had knee joint effusion (and their mean thigh circumference discrepancy was 3 cm). No patient with osteoarthritis presented with altered patellar reflex or knee joint effusion.

Respectively on postoperative day 0.5, 2, 7, 14, 30, and 45, the total numbers of patients with absent or decreased patellar reflex were 91, 91, 59, 9, 0, and 0; whereas the total numbers of patients with knee joint effusion were 9, 79, 51, 3, 0, and 0, with the mean thigh circumference discrepancy being 3, 3, 2, 2, -1, and -1 cm. The negative values were due to muscle atrophy of the operated leg (Table). In the time-sequence plot, the peak frequency of patellar reflex inhibition (on day 0.5) preceded that of the knee joint effusion and the thigh circumference increase (on day 2) [Fig.]. Patellar reflex inhibition correlated positively with knee joint effusion ($r=0.843$, $p=0.035$, Pearson’s correlation coefficient). These 2 factors correlated significantly for all 3 surgical approaches (p<0.0005, Chi squared test). All 3 approaches were associated with patellar reflex inhibition on day 0.5 ($p=0.033$, Chi squared test) and knee joint effusion on day 2 ($p=0.051$, Chi squared test).

The fluid from the 10 knees that were aspirated appeared macroscopically and microscopically normal. Microscopy revealed a white blood cell counts from 0 to 630 mm$^3$, with <25% neutrophils. The mean protein concentration was 2.3 (range, 1.02–3.00) g/100 ml. The mean glucose concentration was 93 (range, 60–132) mg/100 ml.

DISCUSSION

Various pathologic conditions or injuries of the joints can cause capsular distention or effusion (i.e. muscle reflex inhibition leads to muscle atrophy), especially at the knee joint. In our study, patellar reflex inhibition after surgical trauma correlated with subsequent knee joint effusion; the increase of thigh circumference was in synchrony with knee joint effusion. All 3 phenomena occurred in serial order: surgical trauma of the thigh was followed by patellar reflex inhibition and then knee joint effusion and increase in thigh circumference. As the patients recovered, the percentage of occurrence of the 3 phenomena returned to pre-surgery level.

There are limitations to our study. Only the role of surgical trauma in the development of knee joint effusion was examined; other causes may also involve in the pathogenesis. The degree of quadriceps dysfunction was evaluated indirectly based on thigh circumference, which may be affected by haematoma formation. An accurate evaluation of the extent of changes and the correlation with the functionality of the quadriceps muscle should require imaging studies.

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