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Effects of Viscoseal®, a synovial fluid substitute, on recovery after arthroscopic partial meniscectomy and joint lavage

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Introduction

- While the long-term benefits of arthroscopic partial meniscectomy are favourable, the immediate postoperative period up to about 4 weeks after the intervention is characterised by symptoms that include pain, impaired joint function and joint effusion.[1]
- These effects are related to the surgical procedure[2] but may also be due to other factors[3,4] including the lack of synovial fluid, which is removed by joint irrigation during arthroscopy.
- We hypothesised that replacing the synovial fluid after arthroscopic partial meniscectomy with a hyaluronic acid-based synovial fluid substitute (Viscoseal®, TRB Chemedica, Munich, Germany) would reduce the incidence and severity of postoperative symptoms and result in an earlier return of joint function.

Patients and methods

Study design: This was an investigator-initiated, pilot, single-blind, randomised, controlled study.

Inclusion criteria: Male and female patients aged between 18 and 60 years of age were included in the study if they showed evidence of meniscal pathology requiring arthroscopic intervention. All patients were required to provide signed informed consent.

Test product: Viscoseal® contains 0.5% of highly purified sodium hyaluronate obtained by bacterial fermentation. Its concentration is similar to that of hyaluronic acid present in normal synovial fluid.

Evaluation parameters: Pain at rest, pain on squatting, joint swelling, analgesic consumption, Lysholm score, daily activities and efficacy judgement by patients and investigator were all assessed.

Methods: Patients were asked not to take any analgesics or anti-inflammatory medication during a 2-day preoperative washout period. All patients received spinal anaesthesia before arthroscopy.

During arthroscopy, joint lavage was carried out using NaCl 0.9% solution and patients were randomised either to the control group (no further treatment, standard therapy group) or to the Viscoseal® group.

In both groups, a redon drain was placed in the operated knee for 24 h to evacuate any fluid. After final joint lavage, patients randomised to the Viscoseal® group were given 10 ml Viscoseal® through the redon drain into the joint. The drain was blocked and the joint manipulated for 15 min, after which the drain was unblocked. The control group received no treatment.

All patients received diclofenac 50 mg tablets in case of unbearable pain. Diclofenac consumption and pain assessment (using a 100-mm visual analogue scale, VAS) were recorded daily for the first 7 days in a patient diary.

Follow-up visits were foreseen on Days 7, 12 and 28 (end of study).

Statistical method

Demographic data for the two groups were analysed using the Mann–Whitney U test to determine homogeneity. For the efficacy parameters, MW-S statistic and the related one-sided 97.5% Confidence Interval (CI) were calculated using the Mann–Whitney U test (one sided, $\alpha = 0.025$) for all available time-points. Mean and median values were calculated.

Results

- A total of 40 patients completed the study.
- Clinical characteristics presented in Table 1 showed that both groups were homogeneous for age and sex. More patients in the Viscoseal® group (19/20) presented joint effusion at baseline and this was more severe than in the control group.

Characteristic	Viscoseal® (N = 20)	Standard therapy (N = 20)
Age (mean ± SD), years	47.4 ± 8.9	46.4 ± 8.6
Male:female	16:4	16:4
Weight (mean ± SD), kg	78.5 ± 10.0	72.8 ± 11.6
Operated knee (right:left)	9:11	12:8
Joint effusion present	19	12

Table 1: *Clinical characteristics of the patients who completed the study.*

- Pain at rest was slightly different between groups at baseline, though this did not reach significance. On Day 1 after surgery, pain increased by 8.9 ± 23.1 mm in the Viscoseal® group and by 20.0 ± 25.9 mm in the standard therapy group compared to baseline values. The Viscoseal® group was superior to the standard therapy group on Day 1 post-surgery. There were no statistical differences between the groups from Day 2 onwards (Figure 1).

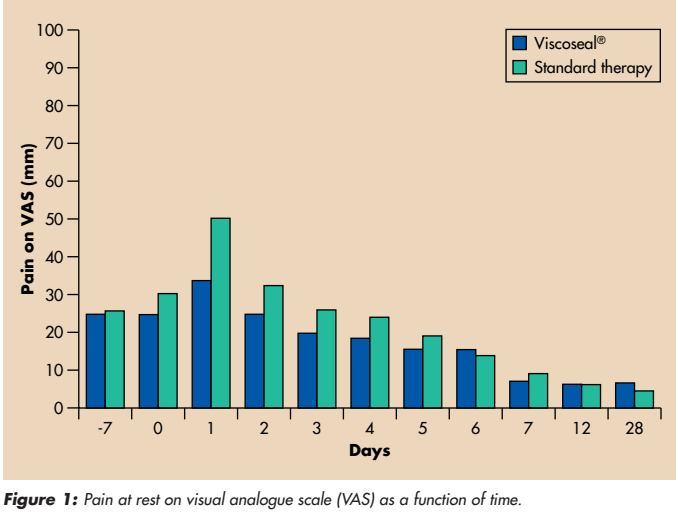

Figure 1: *Pain at rest on visual analogue scale (VAS) as a function of time.*

- While the two groups were not homogeneous for joint swelling at baseline, patients in the Viscoseal® group had less swelling compared to the control group at all post-surgery visits. The superiority of Viscoseal® observed at Day 7 (Lower Bound of the Confidence Interval: LB-CI > 0.5) was proven at Days 12 and 28 (Table 2).

Joint swelling	Day 0		Day 7		Day 12		Day 28	
	Viscoseal® (%)	Control (%)	Viscoseal® (%)	Control (%)	Viscoseal® (%)	Control (%)	Viscoseal® (%)	Control (%)
None	20	40	26	25	45	20	60	35
Mild	25	35	47	50	45	60	40	45
Moderate	50	15	21	15	10	10	0	15
Severe	5	10	5	10	0	10	0	5

Table 2: *Severity of joint swelling according to a 4-point score (percentage of patients).*

- Values for pain on squatting were non-significantly different between groups at baseline. At Day 7, pain on squatting decreased by 28.1 ± 26.8 mm in the Viscoseal® group and by only 10.8 ± 38.2 mm in the standard therapy group. At Day 12 and 28, the difference between groups decreased but patients experienced less pain on squatting in the Viscoseal® group throughout the study (Figure 2). The values obtained at Day 7 (selection visit) were taken as the baseline as most patients found it too painful to perform this assessment at Day 0 before arthroscopy.

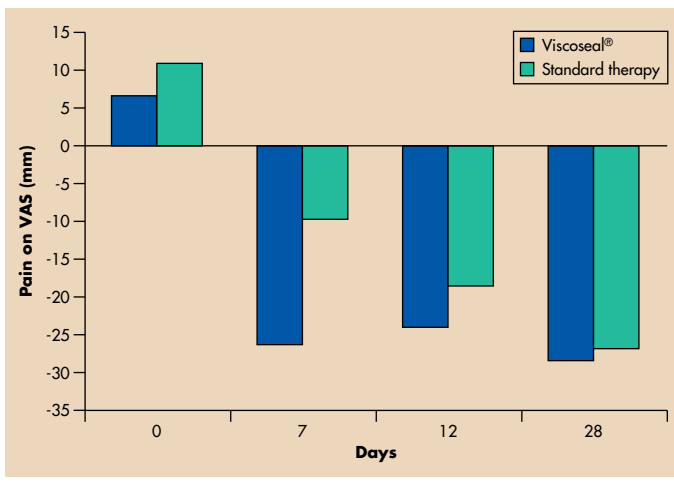

Figure 2: *Pain on squatting on visual analogue scale (VAS) as a function of time (change from baseline).*

- Although diclofenac consumption was slightly higher in the Viscoseal® group on Days 1 and 2, reduced diclofenac consumption was observed in the Viscoseal® group compared to the control group throughout the rest of the study (Figure 3). A proven superiority (LB-CI > 0.5) was observed at days 3, 4 and 7 in the Viscoseal® group.

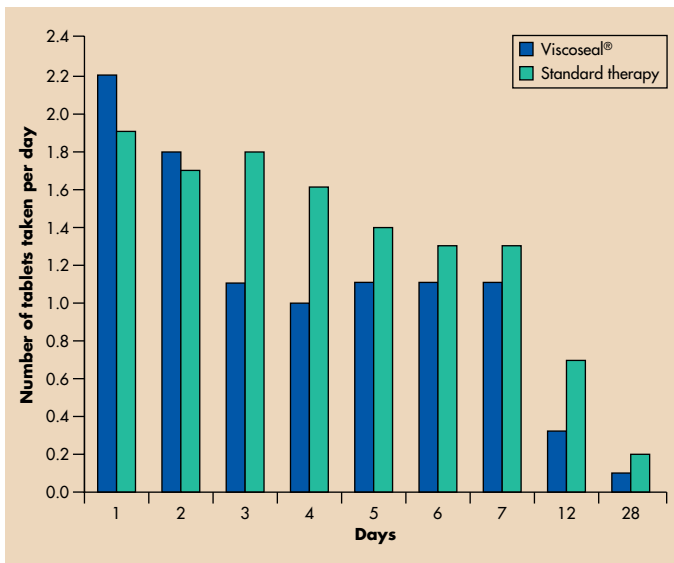

Figure 3: *Diclofenac consumption as a function of time.*

- Both groups had similar values for function using the Lysholm score at baseline, but results showed that function improved in the Viscoseal® group throughout the study (Figure 4).

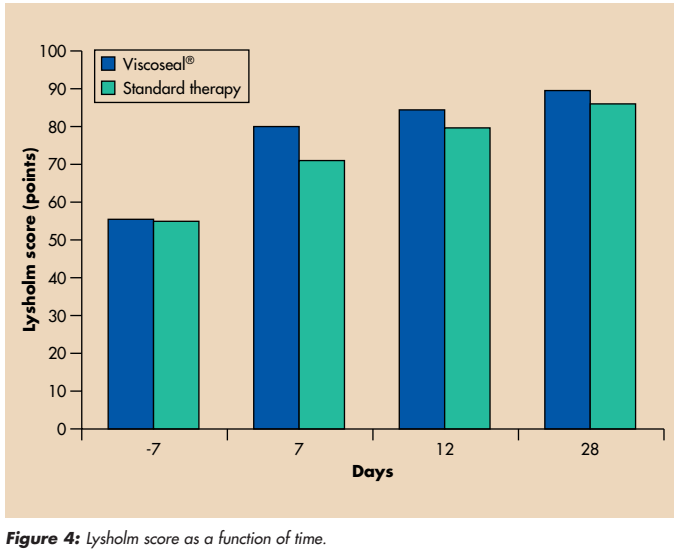

Figure 4: *Lysholm score as a function of time.*

- Although both groups showed similar values for daily activities at baseline and Day 12, patients in the Viscoseal® group experienced an improvement at Day 7 and Day 28 (Figure 5).

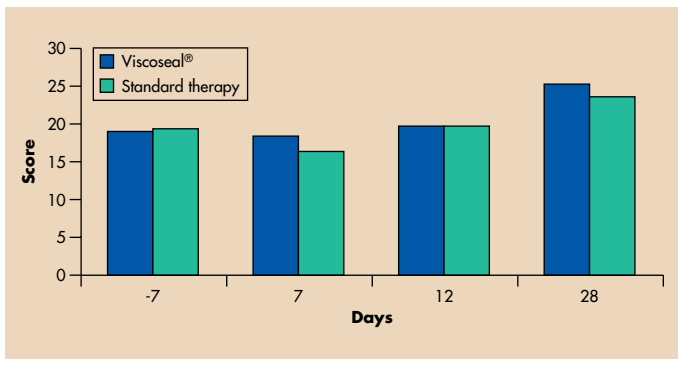

Figure 5: *Daily activities as a function of time.*

- The efficacy judgements expressed by the patients, who were blinded to the treatment they received, were always in favour of Viscoseal® with a proven superiority observed on Days 7 and 12 (Figure 6).

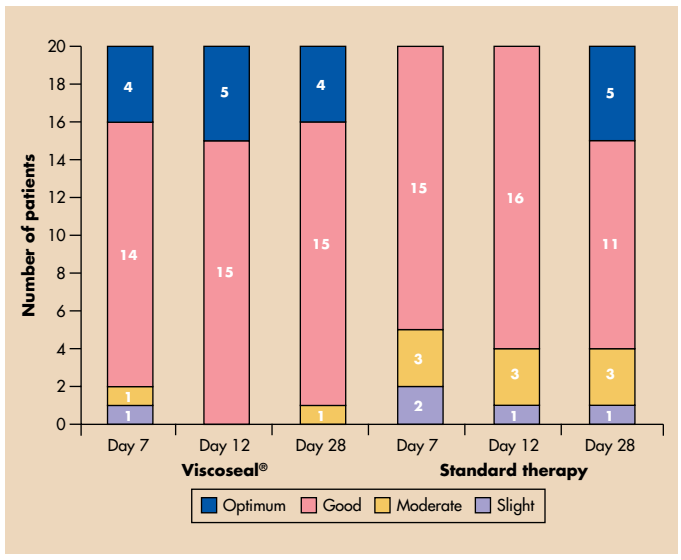

Figure 6: *Global efficacy evaluation by the patients.*

- The efficacy judgements expressed by the investigator showed a similar trend. At Day 7, the investigator judged treatment efficacy as good or excellent in 85% of the patients in the Viscoseal® group compared to 35% in the control group. These results were confirmed at Day 12 and Day 28 (Figure 7).
- No serious adverse events due to Viscoseal® were reported in the study.

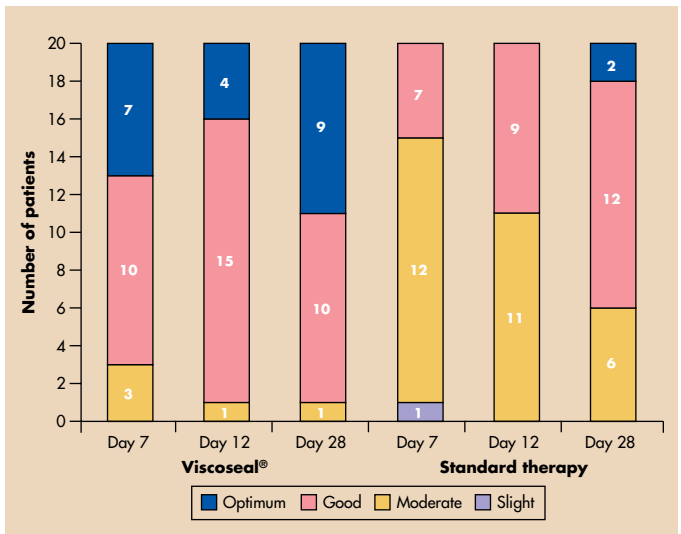

Figure 7: *Global efficacy evaluation by the investigator.*

Conclusion

This pilot, single-blind, randomised study demonstrated that the use of Viscoseal® after arthroscopic partial meniscectomy was safe and effective in improving post-arthroscopy symptoms, especially joint swelling, pain and function. Treatment resulted in an earlier return to normal function and a descreased need for escape medication compared to standard therapy. The use of Viscoseal® should be investigated in other knee arthroscopy procedures such as ligament repair, cartilage repair and meniscal tissue repair.

References

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