



**HAL**  
open science

## **Intradiscal glucocorticoids injection in chronic low back pain with active discopathy: A randomized controlled study**

Isabelle Tavares, Eric Thomas, Catherine Cyteval, Marie-Christine Picot, Federico Manna, Valérie Macioce, Isabelle Laffont, Yann Thouvenin, Pierre Viala, Ahmed Larbi, et al.

### ► To cite this version:

Isabelle Tavares, Eric Thomas, Catherine Cyteval, Marie-Christine Picot, Federico Manna, et al.. Intradiscal glucocorticoids injection in chronic low back pain with active discopathy: A randomized controlled study. *Annals of Physical and Rehabilitation Medicine*, 2021, 64 (2), pp.101396. 10.1016/j.rehab.2020.05.003 . hal-03594257

**HAL Id: hal-03594257**

**<https://hal.umontpellier.fr/hal-03594257>**

Submitted on 24 Apr 2023

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License

## **Intradiscal glucocorticoids injection in chronic low back pain with active discopathy: a randomized controlled study**

Short Title: Intradiscal glucocorticoid for active discopathy

Isabelle Tavares, MD<sup>1</sup>; Eric Thomas, MD<sup>2</sup>; Catherine Cyteval, MD, PhD<sup>3</sup>; Marie-Christine Picot, MD<sup>4</sup>; Federico Manna, MD<sup>4</sup>; Valérie Macioce<sup>4</sup>; Isabelle Laffont, MD, PhD<sup>1,5</sup>; Yann Thouvenin, MD<sup>3</sup>; Pierre Viala, MD<sup>6</sup>; Ahmed Lharbi, MD, PhD<sup>6</sup>; Anthony Gélis, MD, PhD<sup>1</sup>; Arnaud Dupeyron, MD<sup>5,7</sup> \*

<sup>1</sup> Département de Médecine Physique et de Réadaptation, CHU Lapeyronie, Univ Montpellier, Montpellier, France

<sup>2</sup> Département de Rhumatologie, CHU Lapeyronie, Univ Montpellier, Montpellier, France

<sup>3</sup> Département de Radiologie, CHU Lapeyronie, Univ Montpellier, Montpellier, France

<sup>4</sup> Unité de Recherche Clinique et Epidémiologique (URCE), CHU Montpellier, Univ Montpellier, Montpellier, France

<sup>5</sup> Euromov, Montpellier University, Montpellier, France

<sup>6</sup> Service de Radiologie, CHU Nîmes, Univ Montpellier, Nimes, France

<sup>7</sup> Service de Médecine Physique et de Réadaptation, CHU Nimes, Univ Montpellier, Nimes, France

### **Correspondence:**

Arnaud Dupeyron, Service de Médecine Physique et de Réadaptation, CHU Nîmes, Place du Pr R. Debré, 30029, Nîmes Cedex 9  
Mail: [arnaud.dupeyron@umontpellier.fr](mailto:arnaud.dupeyron@umontpellier.fr)  
Tel +33 466683459 / Fax +33 46668

1 **Intradiscal glucocorticoids injection in chronic low back pain with active discopathy: a**  
2 **randomized controlled study**

3

4 Short Title: Intradiscal glucocorticoids for active discopathy

5

6

7 **Abstract**

8 **Background.** The benefit of an intradiscal injection of corticosteroids for low back pain with  
9 active discopathy is not totally resolved.

10 **Objective.** The objective of this study was to estimate the clinical efficacy of an intradiscal  
11 injection of glucocorticoids versus lidocaine in patients with low back pain and active  
12 discopathy (Modic 1 changes).

13 **Methods.** A prospective, single-blind, randomized controlled study was conducted in 2  
14 tertiary care centers with spine units. We enrolled 50 patients (mean age 50 years; 46%  
15 women) with lumbar active discopathy on MRI and failure of medical treatment for more than  
16 6 weeks. Participants were randomly assigned to receive an intradiscal injection of  
17 glucocorticoids (50 mg prednisolone acetate [GC group], n=24) or lidocaine (40 mg [L  
18 group], n=26) by senior radiologists. Outcome measures were low back pain in the previous 8  
19 days (10-point visual analog scale), Dallas Pain Questionnaire, Oswestry Disability Index,  
20 analgesic treatment and work status at 1, 3 and 6 months as well as pain at 1, 2 and 3 weeks.  
21 The primary outcome was change in pain between baseline and 1 month.

22 **Results.** Data for 39 patients (78%; 17 in the GC group, 22 in the L group) were analyzed for  
23 the primary outcome. Pain intensity was significantly reduced at 1 month in the GC versus L  
24 group (mean [SD] -2.7 [2.3] and +0.1 [2.0],  $p < 0.001$ ) but not at 3 and 6 months. At 1 and 3  
25 months, the groups significantly differed in daily activities of the Dallas Pain Questionnaire in

26 favour of the GC group. The groups did not differ in consumption of analgesics or  
27 professional condition at any time. No serious intervention-related adverse events occurred.  
28 Study limitations included patients lost to the study because of injection-related technical  
29 issues in the L5/S1 disc and short time of follow-up.

30 **Conclusion.** As compared with intradiscal injection of lidocaine, intradiscal injection of  
31 prednisolone acetate for low back pain with active discopathy may reduce pain intensity at 1  
32 month but not at 3 and 6 months.

33

34 **Registration:** ClinicalTrials.gov: NCT01694134

35 **Key Words:** low back pain, intradiscal injection, randomized control trial

36

37

## 38 **Introduction**

39 Chronic low back pain (LBP) is a major burden to society and to the individuals affected. It is  
40 the leading cause of years lived with disability (1). Research into disc degeneration is  
41 expanding and has questioned the clinical importance of many spine imaging findings and  
42 clinical symptoms of LBP. In 1980, Modic et al. (2) described changes in vertebral endplate  
43 bone marrow on MRI. Modic type 1 change is associated with LBP (odds ratio 4.0, 95% CI  
44 1.1-14.6) and is considered a strong predictor of pain (3). Indeed, this endplate signal change  
45 is rarely observed in asymptomatic patients (5% to 20%) (4,5). Patients with Modic 1 changes  
46 have an inflammatory pain rhythm and poor chronic LBP outcome (6). The origin of this local  
47 inflammation is unknown and predisposing factors are probably multifactorial (chemical and  
48 mechanical) (7).

49 In patients with Modic 1 changes, therapeutic studies are scarce and consensus is  
50 lacking on the right therapy (8). Fayad et al. showed in a retrospective study that 54% of  
51 patients with Modic 1 changes had more than 50% improvement at 1 month after an  
52 intradiscal injection of acetate prednisolone (9). Cao et al. showed in a double-blind  
53 randomized controlled study that visual analog scale (VAS) score for pain and Oswestry  
54 Disability Index improved significantly at 3 or 6 months after glucocorticoids injection but  
55 not after saline injection in the control group (10). However, this study has been criticized by  
56 several authors (11,12), questioning its reproducibility; in particular, the respective outcomes  
57 were unusual, with a particularly high effect in the treatment group and no effect in the  
58 control group even in the short term, despite the healing process.

59 Recently, Nguyen et al. showed in a prospective randomized controlled study that  
60 intradiscal glucocorticoids injection reduced LBP intensity at 1 month but not at 12 months as  
61 compared with discography alone (13). At 1 month, the mean reduction in LBP intensity from  
62 baseline was better in the glucocorticoids than control group (32.5 vs 17.5). Paradoxically, at  
63 3 months, pain scores were higher in the glucocorticoids than discography alone group (13).

64 These results still question the interest of intradiscal glucocorticoids treatment for  
65 onset time and duration of the effect in active discopathy and the impact of control  
66 intervention. Our study aimed to evaluate at 1, 3 and 6 months the benefit of an intradiscal  
67 injection of glucocorticoids in individuals with LBP and Modic 1 changes as compared with  
68 intradiscal injection of lidocaine.

69

## 70 **Materials and method**

### 71 **Study design and population**

72 This was a prospective, single-blind, randomized controlled study: patients and evaluators  
73 were blinded; only the physician giving injections was aware of the treatment. Patients were

74 recruited in the Physical Medicine and Rehabilitation and Rheumatology departments of  
75 Montpellier and Nîmes university hospitals, France, from July 2012 to August 2016. The  
76 present study is reported according to the CONSORT checklist (Supplementary Fig. S1).

77 Patients aged 18 to 80 years, with LBP for more than 6 weeks, failure of conservative  
78 treatment, and Modic 1 endplate changes were eligible. The exclusion criteria were previous  
79 low back surgery, contra-indication to infiltration and discopathy with Modic 1 signal  
80 changes on multiple lumbar levels.

81 After being informed about the study, patients giving their written informed consent  
82 were included in the trial and randomized to one of the 2 study groups by using a computer-  
83 generated list of random numbers with a 1:1 ratio. Randomization was centralized (performed  
84 by the clinical research unit of Montpellier university hospital with Ennov clinical V6  
85 software), stratified on center and with variable block sizes. This centralized randomization  
86 procedure using electronic case-report forms ensured allocation concealment. The study  
87 protocol was approved by the university ethics committee and was registered at  
88 ClinicalTrials.gov (NCT01694134).

89

## 90 Interventions

91 Included patients were randomized to receive prednisolone acetate (glucocorticoids [GC  
92 group]) for the intervention group or lidocaine (L group) for the control group. The injections  
93 were given by senior radiologists with more than 10 years' experience (CC, YT for  
94 Montpellier center and LA, VP for Nîmes center). To standardize this procedure and to ensure  
95 equal quality of treatment application, participating physicians were trained in performing the  
96 intradiscal injection procedure under fluoroscopic guidance according to a protocol. The first  
97 step of the procedure was identical in the 2 study groups and consisted of an intradiscal  
98 injection with 0.5 ml contrast dye (Iohexol-Omnipaque 300) that allowed for performing

99 discography to confirm the position of the needle within the nucleus. The second step of the  
100 procedure involved injection of 2 ml prednisolone acetate (hydrocortancyl, 2.5%, Sanofi-  
101 Aventis France) in the experimental group and 2 ml lidocaine (lidocaine hydrochloride, 2%,  
102 20 mg/mL, Aguettant) in the control group. The radiologists were not blinded because the  
103 color of the product differed between groups. Radiologists were not allowed to communicate  
104 with patients and other physicians about treatment. After the treatment, the patient had bed  
105 rest for at least 2 hr with observation in the daycare surgery unit.

106           On the basis of data available at the time of the study, lidocaine was used in the  
107 control group for several reasons: first, no treatment has demonstrated any effect for this  
108 condition; second, an analgesic effect was expected for patients with pain undergoing an  
109 infiltration procedure; third, immediate effects of anesthetic treatment should better contrast  
110 the effect at 1 month and later; finally although anesthetic solutions are not currently used for  
111 active discopathy, this should produce pain relief in the lumbar disc.

112           Patients were followed up for 6 months with clinical consultations at 1 month ( $\pm$  4  
113 days), 3 months ( $\pm$  7 days) and 6 months ( $\pm$  14 days) after injection.

114

## 115 Outcomes

116 LBP intensity in the previous 8 days was assessed by the patient by using a visual analog  
117 scale (VAS), with scores ranging from 0 (no pain) to 10 (maximum pain). The primary  
118 outcome was the change in pain score between baseline and 1 month.

119           Secondary outcomes were assessed during clinical visits and/or were self-reported by  
120 patients in diaries between visits. LBP intensity (VAS) was measured at 1, 2, and 3 weeks and  
121 at 3 and 6 months after injection. Disability was assessed with the Oswestry Disability Index,  
122 ranging from 0 to 100. The impact (in percentage) of LBP for daily activities, work and  
123 leisure activities, anxiety/depression and social interest was assessed by the Dallas Pain

124 Questionnaire (14). For each subscale, the higher the score, the higher the impact of pain.  
125 Finally, quality of life was assessed by the Medical Outcomes Study Short-form 36 (SF-36)  
126 (15), with scores ranging from 0 (poorest quality of life) to 100 (best possible quality of life).  
127 All outcomes except the pain score were measured at 1, 3 and 6 months. All questionnaires  
128 were validated in French: Oswestry Disability Index (17) Dallas Pain Questionnaire (16), SF-  
129 36 (17).

130 Analgesics consumption was collected in the patient's diary and at each visit.

131 Professional status and safety outcomes were collected at each visit. All adverse events (AEs)  
132 were collected and reported.

133 The initial declaration on ClinicalTrials.gov was completed after the first inclusion  
134 and needed updates to correct some discrepancies with the protocol approved by the ethics  
135 committee: first, the primary outcome was wrongly declared at 6 months, whereas the sample  
136 size and prespecified statistical analysis were planned at 1 month. Second, the employment  
137 status was not initially specified in ClinicalTrials.gov but was planned in the protocol and  
138 recorded during the trial; it certainly is interesting for clinicians and has been reported at  
139 ClinicalTrials.gov and in the paper.

140

## 141 Statistical considerations

142 *Sample size:* From data from a similar study involving intradiscal lumbar corticosteroid  
143 infiltration (9), the clinically relevant minimal difference in the variation (J1-J30) of the VAS  
144 score for pain between the 2 groups was established at 2 cm (standard deviation 2 cm). The  
145 number of participants was estimated at 18 per group with alpha 5% and power 80% under a  
146 bilateral hypothesis. Given an expected rate of lost to follow-up of 10%, we estimated that we  
147 needed 40 participants. This estimate had to be increased during the study (substantial  
148 modification: favourable opinion of the CPP on October 7, 2015) because of an unanticipated



149 difficulty in performing disc injections in L5-S1 for 5 patients due to the inability to reach the  
150 disc. Therefore, the total number of participants was increased by 25% and therefore 25 per  
151 group.

152

153 Statistical analysis

154 The primary analysis was performed according to the intention-to-treat principle and involved  
155 all patients who were randomly assigned and for whom data for the primary outcome at  
156 baseline and 1 month were available (full analysis set). After checking that missing data were  
157 missing at random, multiple imputation (18) was implemented to confirm our result  
158 (sensitivity analysis).

159 Baseline characteristics are reported with mean (SD) (or median and interquartile  
160 range [IQR]) for continuous variables and frequencies (%) for categorical variables.  
161 Comparisons of primary outcome and other continuous variables involved Student *t* test (if  
162 normally distributed) or Wilcoxon rank test otherwise. Two-sided  $P < 0.05$  was considered  
163 statistically significant. The effect size was estimated by Cohen's *d*. Values of *d* range from  
164 0.01 to 2 and can be interpreted, as suggested by Sawilowsky (19), with the thresholds  
165 0.01/0.20/0.50/0.80/1.20/2 as very small/small/medium/large/very large/huge, respectively.  
166 Statistical analyses were performed with SAS v9.4 (SAS Institute, Cary, NC, USA).

167

## 168 **Results**

### 169 Study participants

170 We randomly assigned 50 participants to receive glucocorticoids or lidocaine injection (Fig.  
171 1). For 5 patients, the intervention was not performed because it was not technically possible  
172 owing to a loss of height of the intervertebral disc; 3 participants withdrew during follow-up  
173 for medical reasons (hepatitis E, lung cancer, diffuse pain) and 3 participants had missing data

174 for the primary outcome. Thus, data for 39 patients (17 in GC group and 22 in L group) were  
175 analyzed for the primary outcome.

176 Intradiscal injection was performed in L4-L5 for 21 participants, in L5-S1 for 22, in  
177 L2-L3 for 5, and in L3-L4 for 2. The injections were done on the day of randomization at a  
178 median (IQR) of 51 (81) days after the MRI. Baseline characteristics of participants are in  
179 Table 1.

180

### 181 Pain assessment

182 The 2 groups significantly differed in the primary outcome: at 1 month, mean (SD) pain score  
183 decreased by 2.7 (2.3) VAS points in the GC group and increased by 0.1 (2.0) points in the L  
184 group ( $p < 0.001$ ) (Fig. 2). Effect size was very large, with a Cohen's  $d$  of 1.36. After multiple  
185 imputation of missing data (for 9 patients), mean pain score evolution was -2.1 (95%  
186 confidence interval -3.1 ; -1.12) for the GC group and -0.1 (-1.18 ; 0.8) for the L group.  
187 Variation in mean pain scores differed significantly between groups as soon as the second  
188 week and up to 1 month, but the difference was no longer significant at 3 and 6 months (Fig.  
189 2). Evolution of mean VAS scores revealed significantly lower pain scores in the GC than L  
190 group from week 1 to month 1 but no differences at 3 and 6 months (Supplementary Fig. S2).

191 At 1 month, the proportion of patients with night awakenings was significantly lower  
192 in the GC than L group (36.6% vs 81%,  $p = 0.004$ ). Morning stiffness duration and LBP  
193 mobility was better but not significantly in the GC than L group.

194

### 195 Disability and quality of life

196 Variation in mean Dallas Pain Questionnaire subscores is displayed in Figure 3. The mean  
197 (SD) "daily activities" subscore improved significantly more in the GC than L group at 1  
198 month (-21.2 [21.9] vs -3.3 [11.8], Cohen's  $d$  0.94) and 3 months (-30.6 [21.5] vs -9.4 [15.1],

199 Cohen's *d* 1.14), and the "anxiety and depression" subscore improved significantly more in  
200 the GC than L group at 3 months (-18.6 [22.1] vs 0.3 [22.7], Cohen's *d* 0.85). Variation in the  
201 "work and leisure activities" and the "social interest" subscores did not differ between groups  
202 during follow-up. Likewise, the variation in Oswestry score did not differ between groups at 1  
203 month (Supplementary Fig. S3). The groups did not differ in physical and mental component  
204 summary scores of the SF-36 during follow-up (Supplementary Fig. S4).

205

## 206 Work status (Table 2)

207 For 33 patients with available data at follow-up, 4 (12%) showed a change in professional  
208 status over 6 months: 2 participants in the GC group and 1 participant in the L group returned  
209 to work but were on sick leave at baseline, and 1 participant in the GC group who was  
210 professionally active at baseline was retired at 3 months. All other participants had the same  
211 professional status during follow-up.

212

## 213 Adverse effects

214 Serious AEs related to LBP were reported in both groups and concerned hospitalization for  
215 usual care of chronic LBP (3 in the GC group and 4 in the L group).

216

## 217 Discussion

218 Our study demonstrates that an intradiscal injection of glucocorticoids can reduce pain in  
219 individuals with LBP and active discopathy from the first week to 1 month as compared with  
220 an intradiscal injection of lidocaine. Pain reduction at 1 month from baseline was -2.7/10  
221 points, which is comparable to that found by Nguyen et al. (-32.5/100) (13). The reduction in  
222 pain intensity increased gradually from 1 week to 1 month (Fig. 2, Supplementary Fig. S2)  
223 and demonstrates for the first time quick pain relief for people with LBP. Although the daily

224 activities subscore of the Dallas Pain Questionnaire was improved significantly at 1 and 3  
225 months, our results confirm the persistent discomfort because the other subscores did not  
226 change, which probably explains the lack of gain in quality of life. Those results are  
227 consistent with previous data (13).

228         The pain relief resulting from the intradiscal glucocorticoids injection is maximal  
229 between 15 days and 1 month. After this, the effect weakly worsened until 3 months and did  
230 not change at 6 months. This rebound of pain between 1 and 3 months after intradiscal  
231 glucocorticoids agrees with Nguyen et al. (13). The anti-inflammatory effect seems to be  
232 reproducible in the short term but may be cleared by psychosocial confounding factors later.  
233 One or 2 ml of hydrocortancyl seems to produce similar effects.

234         In contrast, we found no clinical benefit in the lidocaine group, as was recently  
235 described (20). First, lidocaine cannot be reasonably considered a placebo, which is  
236 confirmed by the absence of effects at 1 month. Second, the relative negative effect questions  
237 the safety of lidocaine in the disc as was previously described (21). Third, the pain relief  
238 observed at 3 and 6 months confirms the participation of the healing process (11) as for  
239 discography alone (13). Therefore, lidocaine does not seem to be a therapeutic option for  
240 active discopathy nor an appropriate comparator.

241         Apart from technical concerns, we did not evidence side effects in the GC group,  
242 which confirms the safety of soluble glucocorticoids for intradiscal injection. The hypothesis  
243 that disc infection could explain part of active discopathy still remains controversial (22). No  
244 antibiotic prophylaxis was proposed in the present study and no discitis was reported during  
245 follow-up. In agreement with most previous studies of intradiscal injection of GCs  
246 (9,13,23,24), the low-grade infection hypothesis seems unlikely.

247         NICE 2016 guidelines do not recommend intradiscal injections for chronic LBP (25).  
248 The place of intradiscal injection of glucocorticoids for LBP remains to be defined, in

249 particular regarding other types of low back injections (26). Epidural glucocorticoids injection  
250 is commonly used for radicular pain with scarce scientific evidence (23). Facet injection  
251 seems to be less effective in active discopathy (27). Finally, only exercises demonstrate a  
252 better improvement for patients with Modic 1 changes versus other MRI abnormalities (28).  
253 Therefore, the place of intradiscal injection to maintain physical activity can be questioned.

254 Our study has several limitations. We included 50 individuals, but only 39 could be  
255 analyzed, mainly because the injection was not possible for technical reasons. The injection in  
256 L5/S1 disc was not possible when the height of the intervertebral disc was too small and when  
257 the slope of the last segment made access to the needle difficult. Patients who had missing  
258 data because they were not injected and those who withdrew due to unrelated medical reasons  
259 were fairly well distributed between the 2 groups. In addition, 3 patients in the GC group had  
260 missing data for the primary outcome. After multiple imputation, the mean difference in pain  
261 evolution at 1 month was 2 (vs 2.8 in the complete-case analysis). Moreover, confidence  
262 intervals of pain evolution in each group show that this evolution was still significantly  
263 different between groups after multiple imputation. Thus, the impact of missing data on the  
264 effect size and significance of the observed difference seems small, despite a slight  
265 overestimation. In the same way, the poor, indeed negative, effect of lidocaine may explain  
266 part of this effect size, which is unusual in this treatment. Moreover, the follow-up was  
267 probably too short to detect side effects but was adapted to detect an effect. Considering  
268 clinical manifestations of discitis, an endpoint at 1 year seems preferable. Because no MRI  
269 was scheduled at the end of the trial, we cannot guarantee the lack of consequences after disc  
270 injection (destructive disc disease, calcification, discitis). Finally, the difference between the  
271 groups in SF-36 subscores at baseline may have limited impact on the results because the  
272 analysis was performed from score differences.

273 LBP is the main cause of disability worldwide; however, gaps between evidence and  
274 practice remain (29,30). The identification of a specific cause of LBP, as in Modic changes,  
275 should not let us forget the biopsychosocial approach recommended for chronic LBP. Indeed,  
276 the individuals have experienced pain for several months or years and there are multiple  
277 contributors to pain and disability. Recent guidelines did not recommend injection for LBP  
278 management, only for severe radicular pain (31). Results of the present study highlight the  
279 pain relief induced by intradiscal injection of glucocorticoids for individuals with LBP whose  
280 nociceptive pain can be related to active discopathy.

281

## 282 **Conclusion**

283 As compared with an intradiscal injection of lidocaine, an intradiscal injection of  
284 glucocorticoids may reduce pain intensity in individuals with LBP and active discopathy  
285 (Modic 1 changes) from the first week after injection to 1 month. This clinical effect was not  
286 maintained at 3 and 6 months and may be explained in part by a specific effect of the active  
287 comparator.

288

289 **Acknowledgements.** The authors thank Anne Cadenne (Clinical Research Coordinator,  
290 Montpellier), Amina El Keurti (Clinical Research Associate, Montpellier), Sarah El Sherif  
291 (Clinical Research Associate, Nîmes) and Claire Belloc (Data Manager, Montpellier) for their  
292 contribution to the study.

293

294 **Funding.** This study was supported by a grant from the CHU Montpellier and CHU Nîmes  
295 (Appel d'Offre GCS-MERRI Montpellier-Nîmes 2011, UF8833). The funders had no role in  
296 the study's design, conduct, or reporting.

297

298 Figure Captions

299

300 **Figure 1.** Flow of participants in the study.

301 **Figure 2.** Variation in low back pain (visual analog scale [VAS]) intensity. Data are mean

302 (SD). Visual analog scale (VAS) scores at weeks 1, 2 and 3 were self-reported by patients in

303 diaries, whereas VAS scores at 1, 3 and 6 months were completed during follow-up visits.

304 **Figure 3.** Variation in Dallas subscores during follow-up.

305

306

### 307 **References**

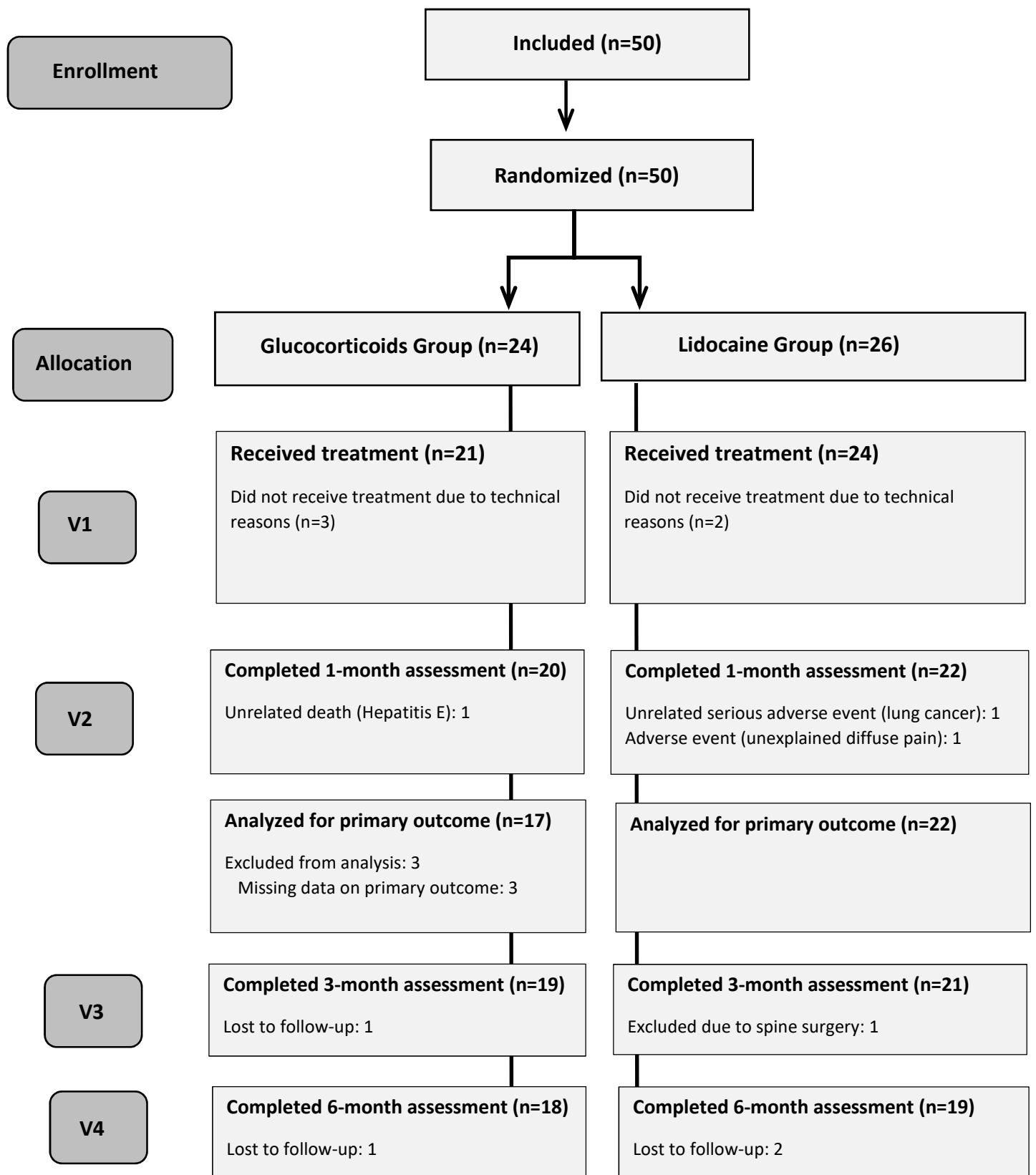
- 308 1. GBD 2013 DALYs and HALE Collaborators, Murray CJL, Barber RM, Foreman KJ,  
309 Abbasoglu Ozgoren A, Abd-Allah F, et al. Global, regional, and national disability-  
310 adjusted life years (DALYs) for 306 diseases and injuries and healthy life expectancy  
311 (HALE) for 188 countries, 1990-2013: quantifying the epidemiological transition.  
312 *Lancet Lond Engl.* 2015;386:2145-91.
- 313 2. Modic MT, Steinberg PM, Ross JS, Masaryk TJ, Carter JR. Degenerative disk disease:  
314 assessment of changes in vertebral body marrow with MR imaging. *Radiology.*  
315 1988;166:193-9.
- 316 3. Brinjikji W, Diehn FE, Jarvik JG, Carr CM, Kallmes DF, Murad MH, et al. MRI  
317 Findings of Disc Degeneration are More Prevalent in Adults with Low Back Pain than in  
318 Asymptomatic Controls: A Systematic Review and Meta-Analysis. *Am J Neuroradiol.*  
319 2015;36:2394-9.
- 320 4. Weishaupt D, Zanetti M, Hodler J, Min K, Fuchs B, Pfirrmann CW, et al. Painful  
321 Lumbar Disk Derangement: Relevance of Endplate Abnormalities at MR Imaging.  
322 *Radiology.* 2001;218:420-7.
- 323 5. Jensen TS, Karppinen J, Sorensen JS, Niinimäki J, Leboeuf-Yde C. Vertebral endplate  
324 signal changes (Modic change): a systematic literature review of prevalence and  
325 association with non-specific low back pain. *Eur Spine J.* 2008;17:1407-22.
- 326 6. Jensen OK, Nielsen CV, Sørensen JS, Stengaard-Pedersen K. Type 1 Modic changes  
327 was a significant risk factor for 1-year outcome in sick-listed low back pain patients: a  
328 nested cohort study using magnetic resonance imaging of the lumbar spine. *Spine J.*  
329 2014;14:2568-81.
- 330 7. Boisson M, Lefèvre-Colau M-M, Rannou F, Nguyen C. Active discopathy: a clinical  
331 reality. *RMD Open.* 2018;4:e000660.
- 332 8. Dudley S, Fields AJ, Samartzis D, Karppinen J, Lotz JC. Pathobiology of Modic changes.  
333 *Eur Spine J.* 2016;25:3723-34.

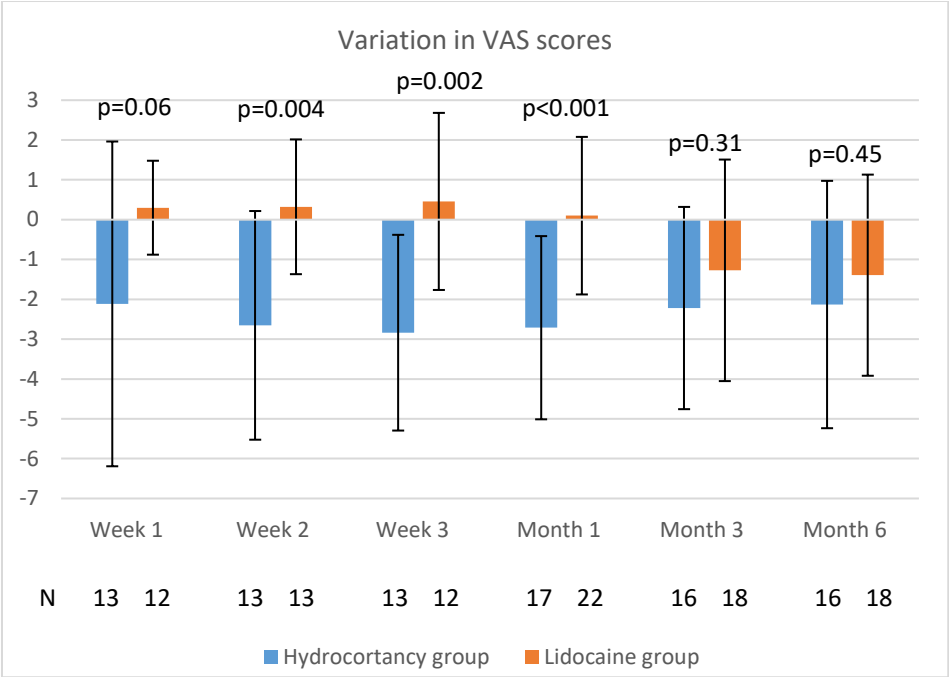
- 334 9. Fayad F, Lefevre-Colau M-M, Rannou F, Quintero N, Nys A, Macé Y, et al. Relation of  
335 inflammatory modic changes to intradiscal steroid injection outcome in chronic low back  
336 pain. *Eur Spine J.* 2007;16:925-31.
- 337 10. Cao P, Jiang L, Zhuang C, Yang Y, Zhang Z, Chen W, et al. Intradiscal injection therapy  
338 for degenerative chronic discogenic low back pain with end plate Modic changes. *Spine*  
339 *J.* 2011;11:100-6.
- 340 11. Fraser RD. Something is amiss. *Spine J.* 2011;11:107-8.
- 341 12. O'Neill C. Modic changes and intradiscal steroids. *Spine J.* 2011;11:109-10.
- 342 13. Nguyen C, Boutron I, Baron G, Sanchez K, Palazzo C, Benchimol R, et al. Intradiscal  
343 Glucocorticoid Injection for Patients With Chronic Low Back Pain Associated With  
344 Active Discopathy: A Randomized Trial. *Ann Intern Med.* 2017;166:547-56.
- 345 14. Lawlis GF, Cuencas R, Selby D, McCoy CE. The development of the Dallas Pain  
346 Questionnaire. An assessment of the impact of spinal pain on behavior. *Spine.*  
347 1989;14:511-6.
- 348 15. Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I.  
349 Conceptual framework and item selection. *Med Care.* 1992;30:473-83.
- 350 16. Marty M, Blotman F, Avouac B, Rozenberg S, Valat JP. Validation of the French  
351 version of the Dallas Pain Questionnaire in chronic low back pain patients. *Rev Rhum*  
352 *Engl Ed.* 1998;65:126-34.
- 353 17. Perneger TV, Leplège A, Etter JF, Rougemont A. Validation of a French-language  
354 version of the MOS 36-Item Short Form Health Survey (SF-36) in young healthy adults.  
355 *J Clin Epidemiol.* 1995;48:1051-60.
- 356 18. Rubin DB. Procedures with Nonignorable Nonresponse. In: *Multiple Imputation for*  
357 *Nonresponse in Surveys.* John Wiley & Sons, Ltd; 2008 p. 202-43.
- 358 19. Sawilowsky S. New Effect Size Rules of Thumb. *J Mod Appl Stat Methods.* 2009;8.
- 359 20. Sainoh T, Orita S, Miyagi M, Inoue G, Yamauchi K, Suzuki M, et al. Single intradiscal  
360 injection of the interleukin-6 receptor antibody tocilizumab provides short-term relief of  
361 discogenic low back pain; prospective comparative cohort study. *J Orthop Sci.*  
362 2016;21:2-6.
- 363 21. Iwasaki K, Sudo H, Yamada K, Ito M, Iwasaki N. Cytotoxic effects of the radiocontrast  
364 agent iotrolan and anesthetic agents bupivacaine and lidocaine in three-dimensional  
365 cultures of human intervertebral disc nucleus pulposus cells: identification of the  
366 apoptotic pathways. *PLoS One.* 2014;9:e92442.
- 367 22. Sotto A, Dupeyron A. Letter to the editor concerning: « Antibiotic treatment in patients  
368 with chronic low back pain and vertebral bone edema (Modic type 1 changes): a double-  
369 blind randomized controlled trial of efficacy » by Albert HB et al. *Eur Spine J* (2013)  
370 22:697-707. *Eur Spine J.* 2013;22:1704-5.



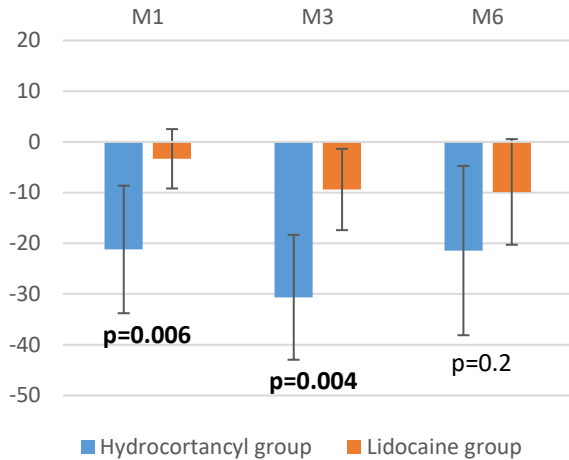
- 371 23. Buttermann GR. The effect of spinal steroid injections for degenerative disc disease.  
372 Spine J. 2004;4:495-505.
- 373 24. Beaudreuil J, Dieude P, Poiraudou S, Revel M. Disabling chronic low back pain with  
374 Modic type 1 MRI signal: acute reduction in pain with intradiscal corticotherapy. Ann  
375 Phys Rehabil Med. 2012;55:139-47.
- 376 25. National Institute for Health and Care Excellence. Non specific low back pain and  
377 sciatica management. NICE guideline 2016. [Internet]. Disponible sur:  
378 [https://www.nice.org.uk/news/article/nice-publishes-updated-advice-on-treating-low-](https://www.nice.org.uk/news/article/nice-publishes-updated-advice-on-treating-low-back-pain)  
379 [back-pain](https://www.nice.org.uk/news/article/nice-publishes-updated-advice-on-treating-low-back-pain)
- 380 26. Khot A, Bowditch M, Powell J, Sharp D. The use of intradiscal steroid therapy for  
381 lumbar spinal discogenic pain: a randomized controlled trial. Spine. 2004;29:833-6;  
382 discussion 837.
- 383 27. Bianchi M, Peterson CK, Pfirrmann CWA, Hodler J, Bolton J. Are the presence of  
384 MODIC changes on MRI scans related to « improvement » in low back pain patients  
385 treated with lumbar facet joint injections? BMC Musculoskelet Disord. 2015;16:234.
- 386 28. Jensen RK, Kent P, Hancock M. Do MRI findings identify patients with chronic low  
387 back pain and Modic changes who respond best to rest or exercise: a subgroup analysis  
388 of a randomised controlled trial. Chiropr Man Ther. 2015;23:26.
- 389 29. Clark S, Horton R. Low back pain: a major global challenge. Lancet. 2018;391:2302.
- 390 30. Foster NE, Anema JR, Cherkin D, Chou R, Cohen SP, Gross DP, et al. Prevention and  
391 treatment of low back pain: evidence, challenges, and promising directions. Lancet.  
392 2018;391:2368-83.
- 393 31. Qaseem A, Wilt TJ, McLean RM, Forcica MA, Clinical Guidelines Committee of the  
394 American College of Physicians. Noninvasive Treatments for Acute, Subacute, and  
395 Chronic Low Back Pain: A Clinical Practice Guideline From the American College of  
396 Physicians. Ann Intern Med. 2017;166:514-30.

397  
398

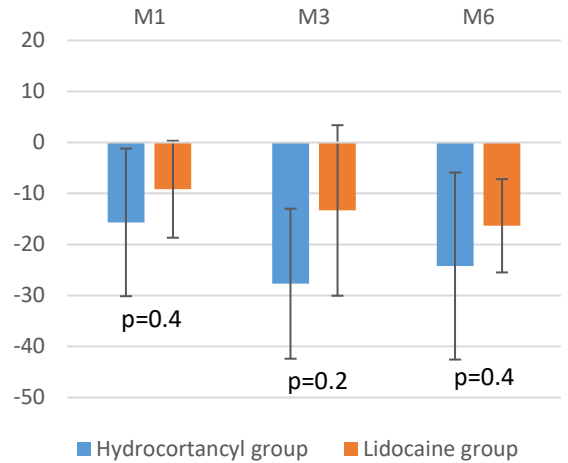




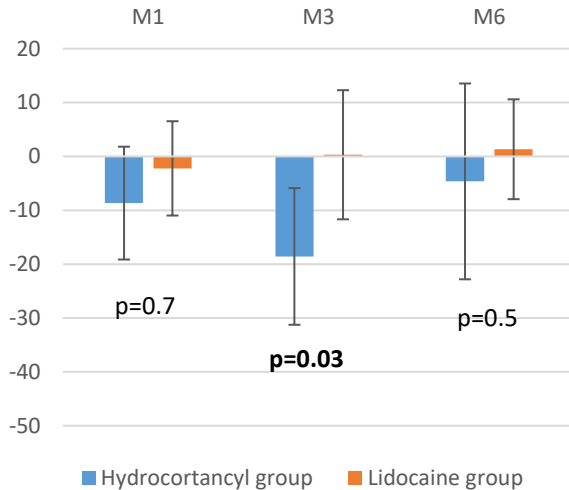
### Daily activities



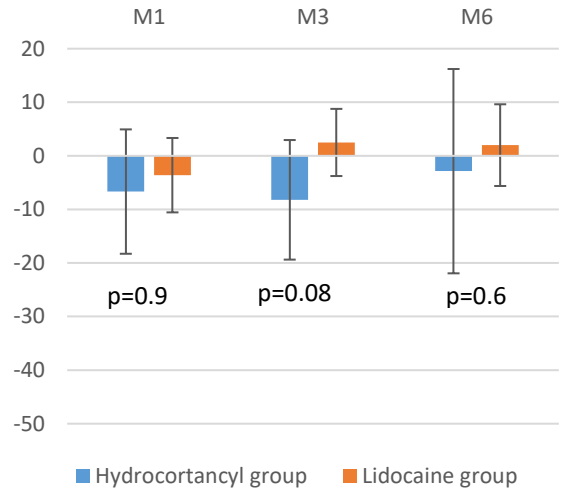
### Work and leisure activities



### Anxiety and depression



### Social interest



**Table 1.** Baseline characteristics of the population.

	N	Glucocorticoids group	N	Lidocaine group
Sex, female, no. (%)	24	9 (38)	26	14 (54)
Age (year) (SD)	24	50 (14)	26	50 (8.7)
<b>Employment status, no. (%)</b>	<b>24</b>		<b>26</b>	
<b>Professionally active</b>		<b>11 (46)</b>		<b>9 (35)</b>
<b>On sick leave</b>		<b>6 (25)</b>		<b>8 (31)</b>
<b>Retired</b>		<b>7 (30)</b>		<b>5 (19)</b>
<b>Disabled, unemployed</b>		<b>0</b>		<b>4 (15)</b>
Night awakening, no. (%)	24	16 (67)	26	20 (77)
Morning stiffness duration (min)	24	30 [15-60]	25	45 [15-60]
<b>Drugs use, no. (%)</b>				
<b>Analgesics</b>	<b>22</b>	<b>12 (55)</b>	<b>26</b>	<b>13 (50)</b>
<b>NSAIDs</b>	<b>22</b>	<b>6 (27)</b>	<b>26</b>	<b>6 (23)</b>
BMI, kg/m <sup>2</sup> , mean (SD)	19	24.9 (3.9)	20	23.7 (4)
Schober test score (mm), mean (SD)	24	28 (11.8)	25	29 (14)
Finger-to-floor test score (cm)	24	21 [13.5-31]	24	11 [2.5-29.5]
<b>VAS for the past 8 days, mean (SD)</b>	<b>22</b>	<b>6.4 (1.8)</b>	<b>26</b>	<b>6.4 (1.9)</b>
		<b>6.0 [5.5-8.0]</b>		<b>6.4 [5.5-8.0]</b>
<b>Dallas, mean (SD)</b>				
<b>Daily activities</b>	<b>20</b>	<b>72 (10)</b>	<b>23</b>	<b>68 (14)</b>
<b>Work and leisure activities</b>	<b>19</b>	<b>70 (14)</b>	<b>23</b>	<b>64 (22)</b>
<b>Anxiety depression</b>	<b>20</b>	<b>44 (23)</b>	<b>23</b>	<b>33 (23)</b>
<b>Social interest</b>	<b>20</b>	<b>36 (23)</b>	<b>23</b>	<b>30 (22)</b>
<b>SF-36 scores, mean (SD)</b>				
<b>PCS score</b>	<b>20</b>	<b>35.9 (5.3)</b>	<b>23</b>	<b>31.1 (7.7)</b>
<b>MCS score</b>	<b>20</b>	<b>33.4 (12.3)</b>	<b>23</b>	<b>40.3 (12)</b>
<b>Oswestry</b>	<b>19</b>	<b>40 (11)</b>	<b>19</b>	<b>41 (15)</b>
Disease duration (years)	21	1.8 [0.6-8.1]	25	2 [0.8-12.2]
Injection site, no. (%)	24		26	
L2-L3		4 (17)		1 (4)
L3-L4		0		2 (8)
L4-L5		9 (37)		12 (46)
L5-S1		11 (46)		11 (42)

NSAIDs, non-steroidal anti-inflammatory drugs; VAS, visual analog scale; SF-36, Medical Outcomes Study Short-form 36; PCS, physical component summary; MCS, mental component summary

Data are median [interquartile range] unless indicated. Data in bold are part of the outcomes specified in the protocol; other data are from the clinical folder (not prespecified in the protocol).

**Table 2.** Clinical and work status outcomes at 1 month after the injection.

		Glucocorticoids group		Lidocaine group	p
Employment status, n (%)	20		22		NA
Professionally active		9 (45)		7 (32)	
On sick leave		5 (25)		8 (36)	
Retired		6 (30)		4 (18)	
Disabled or unemployed		0		3 (14)	
Night awakening, n (%)	19	7 (36.6)	21	17 (81.0)	0.004
Morning stiffness duration (minutes)	20	17.5 [1-52.5]	20	30 [10-60]	0.236
Schober test score (mm), mean (SD)	20	30.9 (11.0)	21	40.5 (26.5)	0.132
<b>Drug use, n (%)</b>	<b>20</b>		<b>21</b>		
<b>Antalgiics</b>		<b>12 (60)</b>		<b>12 (57)</b>	<b>0.85</b>
<b>NSAIDs</b>		<b>3 (15)</b>		<b>4 (19)</b>	<b>1.0</b>

NA, not applicable

Data are median [interquartile range] unless indicated.

Data in bold are part of the specific criteria of the protocol; other data are from the clinical folder (not prespecified in the protocol).