

The Facet Joint and Its Role in Spine Pain Management With Facet Joint Injections

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Mechanical derangements of the lumbar spine, causing predominantly back pain with the absence of nerve root irritation or compromise, present a difficult treatment challenge to the average physician. The author suggests that facet joint injections offer a simple, safe, and often dramatically effective means for managing these problems. The historic background and technique are described in detail. The author presents his personal experience with 99 patients receiving a total of 117 facet joint injections in this retrospective, uncontrolled review. Results were classified as excellent in 17%, good in 25%, fair in 9%, mediocre in 4%, and no change in symptoms occurred in 44%. The procedure is recommended for diagnostic and conservative therapy. [Key words: low-back pain, zygapophyseal joints, facet joint injection, diagnosis, therapy]

THE ROLE OF THE FACET JOINT is of increasing interest to those involved in treating patients with lumbar spine pain. Attention was first turned to facets as a source of pain by Goldthwait in 1911,¹² and reinforced by Putti in 1927.²² Ghormley (1933)¹⁰ introduced the term, "facet syndrome." He pointed out that many of the aches and pains known as backache or true joint pain represents the same type of joint pain as seen in arthritis of the hips, knees, etc. Badgley (1941)¹ emphasized the importance of the facets in low-back and leg pain and thought that 80% of low-back pain and sciatica were on the basis of referred pain and not on the basis of direct nerve irritation. The concept of intervertebral disc rupture¹⁷ overshadowed the role of the facet joints in producing back and leg pain. Recently, the pendulum has shifted away from the disc as a source of most back problems, toward an awareness that the entire intraspinal segment is important, and that the facet joint plays a key role.

Attention was returned to the facet as a source of pain by Pederson et al in 1956.²¹ Hirsch (1963)¹³ demonstrated that pain in the back and upper thigh could be reproduced by injecting 10% hypertonic saline in the region of the facet joints. In 1971, Rees,^{24,25} developed the procedure of bilateral subcutaneous rhizolysis. He performed 2000 operations using closed surgical techniques in which a long scalpel blade allegedly penetrated to the intertransverse ligament with the purpose of severing the posterior rami supplying the facet articular capsule. He claimed a 99.8% success rate. Toakley³³ and Marshall¹⁶ also reported their experiences using this procedure.

Subsequent studies have questioned seriously the validity of this procedure.^{2,15} In this country, Shealy began utilizing Rees methodology but soon abandoned this technique due to huge hematoma developing in 6% of his patients. He then turned to the

"much less traumatic" temperature controlled, radio-frequency catheter technique for denervating the spinal facet joints.^{28,29,30,31} Other studies of the surgical anatomy of facet denervation have demonstrated anatomic error in needle placement and seriously question whether or not a true denervation was carried out.^{2,3} In 1979, Bogduk and Long refined Shealy's technique, attempting to denervate selectively the medial branch of the dorsal ramus.¹³ Selby^{26,27} attempts denervation by the injection of 10% phenol and glycerine. Direct open surgical rhizotomy also has been reported.⁸ A recently controlled double-blind study of radio-frequency rhizolysis in the management of low-back pain indicates that it did not alter the natural cause of backache or referred pain in the leg.³²

Facet joint injections with cortisone and lidocaine have been used as a diagnostic and therapeutic modality.¹⁸ Facet joint arthrography also has been utilized to study facet referred pain.^{7,8,11,18,20}

In testing the facet joints of 110 patients, Mooney¹⁸ achieved long-term relief in 1/5 of the patients with lumbago and sciatica and partial relief in 1/3. Park²⁰ investigated 100 patients who complained of lumbago or sciatica, which was clinically indistinguishable from the disc syndrome and found that patterns of referred pain from the facet joints could be induced in the low-back, buttock or leg by facet arthrography and could be reversed by injecting 2-5 cc of 1% lidocaine through the same needle. He found that by injecting these joints with intraarticular steroids, long-term relief of chronic back pain could be achieved in 20% and partial relief in 30%. Selby²⁶ did 100 consecutive facet joint injections in an office population, using the following criteria: (1) lack of response to conservative care in 1-2 weeks; (2) negative neurologic evaluation; (3) negative straight leg raising; and (4) low-back, hip, and buttock pain. Forty-five percent had no response, 26% had positive response with permanent relief, 29% had short-term relief, and 22 of those were reinjected; 12 of those underwent facet desensitization with phenol, unilaterally at three levels, with good relief.

ANATOMY

Adjacent vertebrae are connected by the intervertebral discs anteriorly and the lumbar zygapophyseal (facet) joints posteriorly. These joints are formed by the superior and inferior articular processes of successive vertebrae. Each superior articular process has a prominence on its dorsolateral surface called a mammillary process. A second bony prominence called the accessory process arises from the dorsal surface of the transverse process near its junction with the superior articular process (Figure 1). The mammilloaccessory ligament is a fibrous, sometimes ossified band connecting these two processes, thus forming a tunnel, through which passes the medial branch of the posterior primary ramus. Upon emerging from this tunnel, the medial branch gives off three branches, (1) *proximal branch*, which hugs the bone, hooks on the articular process, and innervates the facet; (2) *medial descending branch*, which passes medially and downward to innervate the superior and medial aspects of the capsule below as well as giving

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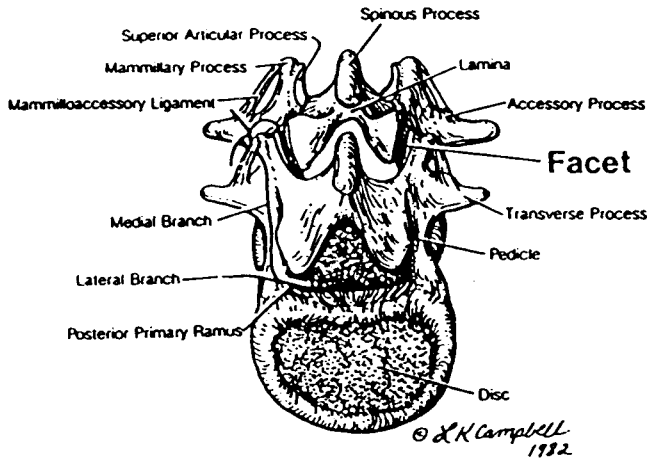


Fig 1. Bony anatomy of the facet joint showing innervation.

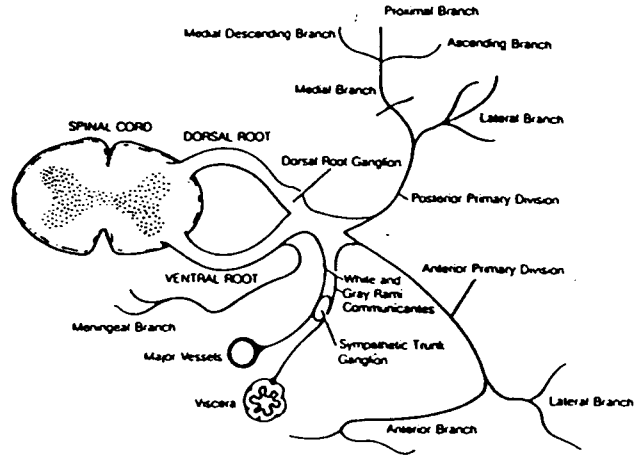


Fig 2. Segmental spinal innervation—schematic drawing.

muscular and cutaneous branches; and (3) the *ascending branch*,² which arises from the mixed spinal nerve, just anterior to the intertransverse fascia and ascends through the soft tissues to the posterior aspect of the facet above. In this manner, each medial branch supplies at least three facet joints. There is no evidence of contralateral innervation.

The *facet joint* itself is a true synovial joint with hyaline cartilage surfaces and a joint space enclosed in a fibrous capsule, lined with a synovial membrane. These joints are oriented obliquely to the sagittal plane. Occasionally, this obliquity varies from one side to the other, resulting in facet asymmetry (tropism), which probably leads to altered spinal mechanics of the segment involved and may lead to premature degenerative arthritis. The *capsule of the facet joint* blends with the ligamentum flavum on its medial and superior aspects. The outer portions of the ligamentum flavum may prevent the capsule from being nipped between the two articular surfaces during movement and from protrusion into the spinal foramen. Carrera⁴, worries about the effect of facet joint synovial fluid on the nerve root after the removal of the ligamentum flavum. His studies, via facet arthrography, also have demonstrated facet capsule out-pouchings, compressing nerve roots in the foramen and causing sciatica.⁴

The *facet synovial lining* is made up of villi, which may vary in size, shape, and appearance, and which contain a rich supply of blood vessels and nerves.

The *innervation* of the capsule of the facet joints is via sensory fibers and has been described in detail in other papers (Figure 2).^{2,11,12,14,15}

THE FACET SYNDROME

The localization of pain in low-back, buttocks and legs is a nonspecific finding that can develop from noxious stimuli other than the facet joint, but facet abnormalities can account for many of the symptoms of spine pain, including sciatica.¹⁵ The classic signs and symptoms of herniated disc with nerve root compression will not be belabored here. It should be mentioned that the element of back pain associated with leg pain and paresthesias of herniated discs may be facetogenic in nature. That element of the pain might be controlled with facet joint injections. Symptoms of lumbar disc protrusion often can be similar to those symptoms of facet problems; the two are somewhat interrelated as that protruding disc might cause facet synovitis. Lumbar disc protrusion symptoms are usually bilateral rather than unilateral. *Symptoms* of a classic facet syndrome are: (1) hip and buttock pain; (2) cramping leg pain, primarily above the knee; (3) low-back stiffness, especially

in the morning or with inactivity; and (4) absence of paresthesias. The *signs* of a classic facet syndrome are: (1) local paralumbar tenderness; (2) pain on spine hyperextension; (3) absence of neurologic deficit; (4) absence of root tension signs; and (5) hip, buttock, or back pain on straight leg raising. (*Pathogenesis*—any abnormality of the facet joint can theoretically cause a facet type of syndrome: (1) inflammation or synovitis [traumatic, rheumatologic]; (2) segmental instability; and (3) degenerative arthritis.)

Injection of the facet joint with a combination of cortisone and lidocaine diagnostically can relieve pain and is often therapeutic, probably by the steroid's antiinflammatory action, but it is also conceivably that because *intraarticular steroids cause fat atrophy*, there may be decompression of mechanically compressed hypertrophic synovial villi (Figure 3).⁴

TECHNIQUE OF FACET JOINT INJECTION

The technique is simple, safe, and can be done as an out-patient procedure. The author prefers to use 11 cc of 1% of lidocaine and 1 cc. of 80 mg Depo-Medrol. Other necessary equipment include six 22-gauge, 1.5-inch spinal needles, one 12 cc syringe, one 18-gauge needle, one package of sterile towels, a local antiseptic, eg, merthiolate and sterile gloves. The patient then is placed in a 30-45° oblique manner to visualize the facet joints. The spinal

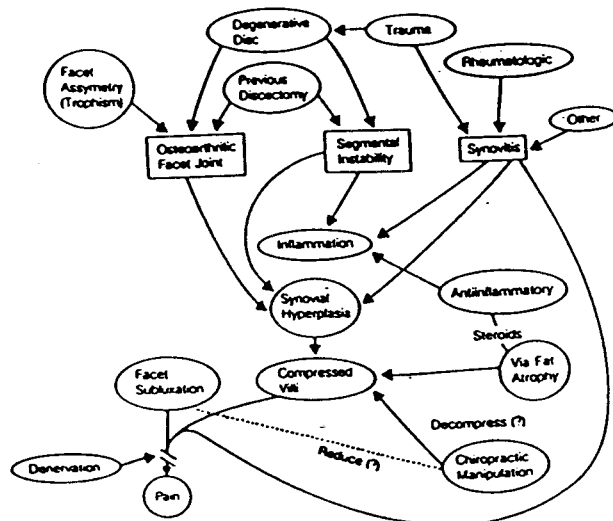


Fig 3. Pathogenesis and rationale for treatment of facet derangement.

needle then is moved until it lies directly over the facet. The use of local anesthetic is optional. (The author has not found it necessary.) The needle then is passed in a perpendicular manner toward the joint until it hits bone. It then is "walked" into the joint. One often can feel a rubbery give as the needle enters the joint. This is controlled with fluoroscopy (taking films for permanent record is optional). Approximately 2 cc of a mixture of 1 cc of 1% lidocaine and 1 cc of 80 mg Depo-Medrol then is injected. The procedure then is repeated at the appropriate levels. Injection site depends on the pathology. If one is dealing with an obvious osteoarthritic facet, then only that facet should be injected. The demonstration of osteoarthritic facets by CAT scanning and the results of injections of these facets with steroids has been described by Carrera.^{3,6} If one is using arthrogram provocation,^{4,20} then those joints causing pain are injected. The author has had no personal experience with arthrography and routinely injects the three lower-most facet joints, unilaterally if hip and buttock pain is unilateral, bilaterally if the pain is bilateral.

RESULTS

The author recognizes that the study is an uncontrolled, retrospective review and offers these results with that in mind. Ninety-nine patients received a total of 117 facet joint injections. There were 58 men and 41 women. Age range was from 17 to 71. Duration of symptoms varied from 2 weeks to 16 years; 57 were involved in Workman's Compensation injuries, 24 in motor vehicle accidents with pending litigation. Twenty had had previous diskectomies. There were no complications, and no one was made worse. All patients had a 2-week trial of bed-rest and anti-inflammatory medication. Those who failed to improve significantly underwent facet joint injections. Recognizing the possibility of a placebo effect and acknowledging that the criteria of a good result are subjective, the following criteria were used to determine the effectiveness of the block: (1) excellent result—complete relief of symptoms for 3 months or more and ability to return to work if

previously not working—17%; (2) good result—greater than 70% symptomatic relief, ability to return to work—25%; (3) fair result—50% symptom relief, this being significant to alter life-style and ability to return to work—9%; (4) mediocre result—slightly improved with facet joint injection, but not significant to change disability pattern—4%; and (5) no result—no change in symptoms—44%.

Due to the complexity and variation in terms of the problems facing the various patients, an attempt was made to break down and explain various results. Factors taken into consideration were: (1) pattern of pain, ie, unilateral versus bilateral hip and buttock versus back pain; (2) duration of symptoms; (3) previous spine surgery; and (4) presence of litigation or Workman's Compensation. No pattern could be determined to predict results. Of those patients with excellent results, eight were involved in litigation or Workman's Compensation injuries. Duration of symptoms ranged from 1 month to 16 years. Eight of them had complete relief with one treatment. Four were symptomatic for 3–6 months, and two of these had relief with repeat injections (Table 1). Five had relief for less than 3 months. One of these had complete relief of back pain, but continued leg pain, secondary to radiculopathy and cured with diskectomy. Of those patients who received no benefit from the facet joint injections, one proved to have vascular problems, and his symptoms were relieved with appropriate vascular surgery; four had spinal stenosis; three showed central disc herniation on subsequent myelography; three showed arachnoiditis on subsequent myelography; and eleven were diagnosed as having a compensation neurosis on psychological work-up. Twenty-two of the 44 with no change in symptoms following facet injections did not return for follow-up for reasons unknown.

CONCLUSION

The use of facet blockade techniques is helpful in identifying a significant source of pain in many patients. It is simple, safe, diagnostic, cost-effective, and therapeutic. It should be used more frequently in the management of patients with back problems.

Table 1. Case Examples

Patient no.	Age	Sex	WC/Litigation	Dur/Symp	Symptoms	Prev/rx	Prev/wu	%Rel-/ji	Comments
1	35	M	No	1 mo*	Unilat. hip and buttock pain	Manipulation	(-) Myelogram (-) Bone scan	100%	
2	21	M	Yes	2 mo	Back pain, morning stiffness			100%	
3	35	M	Yes	9 mo	Back pain		(-) Bone scan	100%	
4	31	M	Yes	2 mo	Unilat. hip and buttock pain, stiffness		(-) CAT scan (-) Bone scan	100%	
5	33	F	No	1 1/2 yr†	Unilat. hip and buttock pain	Presacral neurectomy	(-) Bone scan	100%	
6	25	M	Yes	1 mo	Unilat. hip and buttock pain		Spondylolithiasis (-) Bone scan	100%	
7	23	F	Yes	5 mo	Unilat. hip and buttock pain and stiffness		(-) Bone scan	100%	
8	20	M	Yes	5 mo	Unilat. hip and buttock pain	Chiropractor		100%	
9	24	F	Yes	6 mo	Back pain	Psychiatrist		100% × 6 mo then 100% lasting at 4 mo	

(continued)

Table 1. Case Examples (continued)

Patient no.	Age	Sex	WC/Litigation	Dur/Symp	Symptoms	Prev/rx	Prev/wu	%Rel-fji	Comments
10	42	F	No	16 yr	Bilat. hip and buttock pain, back pain	Chiropractor psychiatrist	Old compression fx. L2-3, (-) bone scan	100% × 5 mo then 100% lasting at 3 mo	
11	36	F	No	5 yr	Unilat. hip and buttock pain	Fatty tumor removed from each buttock	9 myelograms—WNL (-) CAT scan (-) Bone scan	100% × 3 mo	When symptoms resumed: diskogram (+) 4-5 then spine fusion with good relief
12	34	M	No	2 yr	Back pain	Diskectomy L4-L5	(-) Myelogram	100% × 3 mo Repeat ineffective	Previous diskectomy with relief of leg pain but back pain worse. When repeat Facet block failed, diskogram (+) L4-L5 then fusion with good results
13	29	F	Yes	2 yr	Back pain	Chiropractor	(-) Myelogram (-) Bone scan (+) Diskogram L4-L5	100% × 3 wk ‡	Spine fusion with good results
14	35	F	Yes	8 mo	Low-back pain, stiffness	Chiropractor	Disk degeneration L5-S1	80% lasting at 6 mo	
15	44	F	Yes	3 mo	Bilat. hip and buttock pain	Epidural block	(-) X-ray	70% lasting at 9 mo	
16	34	F	Yes	1 yr	Unilat. hip and buttock pain		(-) X-ray	70% lasting at 5 mo	
17	48	F	No	14 yr	Back pain		(-) X-ray	100% × 6 mo, then 80% lasting at 2 mo	
18	59	M	Yes	5 mo	Bilat. hip and buttock pain, stiffness		(-) X-ray	70%	
19	32	M	Yes	1 yr	Unilat. hip and buttock pain		Central disc protrusion without root compromise on myelogram	75% × 2 mo, then 75% lasting at 4 mo	
20	33	M	Yes	2½ mo	Bilat. hip and buttock pain		(-) X-ray	90% × 2 mo, then 80% lasting at 4 mo	
21	28	F	Yes	1 yr	Unilat. leg without paresthesias, back pain		(-) Myelogram, root tension signs on exam, (+) diskogram L4-5	90% back pain relief	Leg pain persisted, diskectomy with subsidence of leg pain
22	34	M	Yes	29 mo	Unilat. hip and buttock pain		L3 compression fx., (-) bone scan, (-) myelogram	80% lasting at 3 mo	
23	49	M	No	3 mo	Unilat. hip and buttock pain		(-) Bone scan (-) X-ray	0%	High grade stenosis at iliac bifurcation referred to vascular surgeon
24	52	M	Yes	3 mo	Back pain	Diskectomy	(+) nerve study L5 herniated disc L4-L5 on myelogram. Spinal stenosis on CAT scan	0%	Wide decompression and diskectomy L4-L5 with good result
25	31	F	No	4 mo	Bilat. hip and buttock pain		Myelogram, HNP L4-L5	0%	Good relief with diskectomy

*mo = month; †yr = year; ‡wk = week.

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