Koeck et al., Gen Med (Los Angel) 2013, 1:4
DOI: 10.4172/2327-5146.1000117

General Medicine: Open Access

Case Report Open Access

Epidural Granuloma by Dislocated Catheter Tip Associated with Spinal Cord Compression in High-Dose Intrathecal Morphine Therapy

Koeck K[1]*, Grossauer S[1], Trummer M[1] and Kleinert R[2]

[1]*Department of Neurosurgery, Medical University Graz, Austria*
[2]*Department of Pathology, Medical University Graz, Austria*

Abstract

Intrathecal drug delivery systems are an option for selected patients with chronic pain. Complications such as intrathecal catheter-tip inflammatory masses are already reported in literature. In the present case report we describe a patient suffering from neuropathic pain located on the anterior aspects of both thighs following failed back surgery. Two years after implantation of an intrathecal morphine pump system the patient experienced symptoms of a spinal cord compression with increasing radicular pain, especially after application of morphine bolus. Within this time frame the average daily intrathecal morphine hydrochloride dose was 3.2 mg per day and the total neuraxial morphine hydrochloride dose was 2460 mg. Magnetic resonance imaging revealed spinal cord compression from an epidural mass measuring 13×11×10 millimeters, originating from an epidural dislocation of the intrathecal catheter. After surgical removal of the mass, histological examination confirmed a disseminated formation of a granuloma. What makes this case so special, is the fact that the granuloma is not located intrathecally, but in the epidural space (epidural granuloma). The formation of a purely epidural granuloma due to a dislocated catheter tip has - according to our research - not been reported about up to the present.

Keywords: Granuloma; Intrathecal drug delivery systems; Morphine; Catheter

Introduction

Intrathecal opioid administration in the treatment of intractable chronic non-malignant pain and cancer pain is well documented in the neurosurgical literature. Indications for intrathecal drug delivery systems in patients with non-malignant pain include failed back surgery syndrome, neuropathic pain, complex regional pain syndrome, diffuse pain, axial spinal pain, brachial plexitis, central pain, failed spinal cord stimulation therapy, arachnitis, post stroke pain, spinal cord injury pain and peripheral neuropathy [1]. Serious side-effects of intrathecal morphine pumps, such as nausea, vomiting, pruritus, urinary retention, constipation, sexual dysfunction and peripheral edema are rare and mostly dose-dependent [2-8]. Those complications are usually mediated by opioid receptors. Intrathecal granulomas developing around the tip of the intrathecal catheter are a less common complication leading to symptoms of spinal cord compression and reduced therapeutic effects. Drug concentration and dose are supposed to be potential causative factors in the formation of catheter-associated masses [9,10]. A strong evidence that inflammatory masses at the catheter tips are caused by highly concentrated morphine infusate was identified by Yaksh et al. [11] in animal models.

The incidence and prevalence of these complications are inconsistent in literature and range from approximately one intrathecal mass per 1000 patients [12] to three intrathecal masses out of a group of 60 patients [13]. The incidence of inflammatory mass lesions after 1 year of therapy has been estimated to be 0.04% but increases to 1.15% after 6 years [11].

According to our research there has been no report about the formation of a purely epidural granuloma due to a dislocated catheter tip to the present.

Case Report

We present the case of a 47-year-old-woman with a 5 years history of lumbar spine pain. The most important side diagnoses were obesity (height: 165 cm, weight: 86 kg), a history of cigarette smoking (18 pack years) and non-insulin dependent diabetes mellitus. She has undergone three lumbar laminectomies and an AXIAL- LIF at L5/S1-without pain relieving outcome. Consequently a spinal cord stimulator (SCS) was placed but the pain-reduction was not satisfactory. At that time the patient suffered from neuropathic pain and paraesthesia located at the anterior aspects of both thighs without any further neurologic deficit. Ultimately, an intrathecal morphine pump was placed in 2006. Operation technique: After percutaneous puncture of the dural sac with a 17 Gauge Tuohy needle at L2-L3, the intrathecal needle tip location was verified by cerebrospinal fluid flow at 5.5 cm puncture depth. A spinal catheter (Spinal Catheter Set 4000®) with a closed catheter tip and 6 separate holes at the end of the catheter was advanced 14.5 cm under fluoroscopic control up to the level of T10. Again the catheter was checked for cerebrospinal fluid flow. Then the Tuohy needle was removed and a small skin incision was made directly below the skin entry point of the catheter. The catheter was fixed with two stitches on the supra spinal ligament using a silicone anchor. Contrast agent was administered through the catheter to verify the intradural position using fluoroscopy. Finally the catheter was tunneled subcutaneously to be connected with the port and the pump. Her post-operative response was good, her pain was reduced and the patient was satisfied. Two years later, she experienced increasing back pain with radiation into both legs and abdomen, especially when she was applicating bolus of morphine. Her morphine dose escalated rapidly up to 35 mg per day. Within this time frame the average daily intrathecal morphine hydrochloride dose was 3.2 mg per day and the total neuraxial morphine hydrochloride dose was 2460 mg.

***Corresponding author:** Koeck K, Department of Neurosurgery, Medical University Graz, Austria, E-mail: katharina.koeck@aon.at

Received August 20, 2013; **Accepted** September 10, 2013; **Published** September 20, 2013

Citation: Koeck K, Grossauer S, Trummer M, Kleinert R (2013) Epidural Granuloma by Dislocated Catheter Tip Associated with Spinal Cord Compression in High-Dose Intrathecal Morphine Therapy. Gen Med (Los Angel) 1: 117. doi: 10.4172/2327-5146.1000117

Because of increasing radicular leg pain and constrained walking abilities magnetic resonance imaging was arranged and revealed an epidural expansion measuring 13×11×10 millimeters located on the tip of the catheter, which was obviously dislocated from intrathecal to epidural space (Figures 1-3). The epidural catheter tip was encased by the mass at level T11-12, compressing the spinal cord. The patient underwent surgery and had the mass resected via a hemilaminectomy at the left side of T11. The expansion was immediately apparent underneath the lamina and the yellow ligament; it was carefully dissected from the dura. The granuloma was incised and decompressed. The tip was encountered in surgery and removed during the preparation of the granuloma mass. The granuloma-wall adherent to the dura was left since it could not be freed from the dura. During the whole surgical procedure there was no sign of dural laceration or cerebrospinal fluid leakage at the level of surgery.

Histological analysis of the mass revealed an inflammatory reaction in the dura corresponding to a granuloma (Figure 4 and 5). A new intrathecal catheter was placed and the dosage was adjusted again to the patient´s daily morphine demands. The sensations from her abdomen to the lower extremities improved.

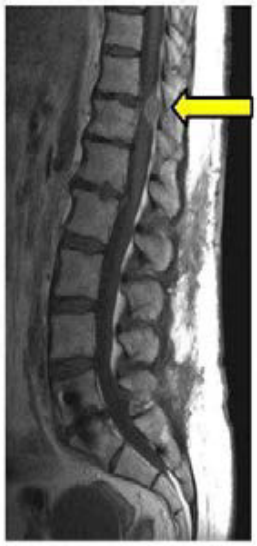

Figure 1: T1 sagittal contrasted which clearly shows the lesion compression the spinal cord (granuloma measures in axial, transversal and sagittal diameter: 13×11×10 millimeters).

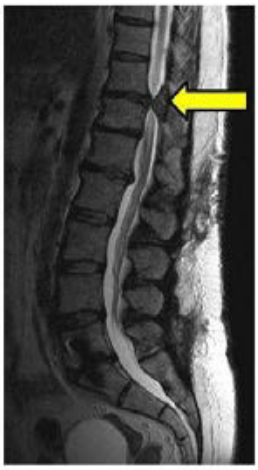

Figure 2: T2 sagittal showing the massive spinal compression (granuloma measures in axial, transversal and sagittal diameter: 13×11×10 millimeters).

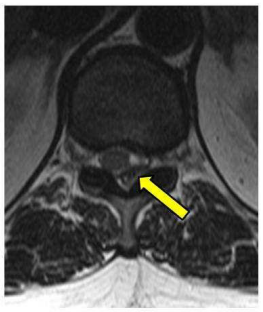

Figure 3: T1 contrasted axial image (granuloma measures in axial, transversal and sagittal diameter: 13×11×10 millimeters).

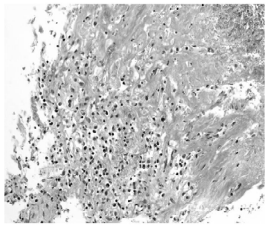

Figure 4: Representative field taken from granuloma, showing parts of dura in the upper right half of the image with disseminated formations of granuloma and degenerative transformations in the lower left part of the image; inflammatory dissociation of collagen fibers, focally embedded detritus (original magnification x 20, hematoxylin eosin staining).

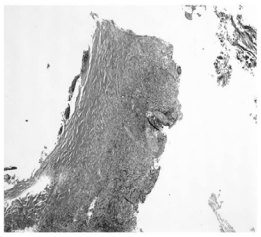

Figure 5: Representative field taken from granuloma, showing parts of dura in the left half of the image with disseminated formations of granuloma and degenerative transformations in the right part of the image; inflammatory dissociation of collagen fibers, focally embedded detritus (original magnification x 4, hematoxylin eosin staining).

Discussion

The phenomenon of inflammatory masses at the tips of intrathecal catheters was first reported in 1991 [14]. Hypotheses that could explain the formation of catheter tip inflammatory masses, such as foreign-body reaction to silicone and other catheter material, infection, catheter-tip design, and the infusate-especially opioid analgetics, have been proposed [9,11].

In a prospective analysis 3% of 208 patients developed intrathecal granuloma-80 percent of the patients were asymptomatic [15]. It seems therefore considerable, that patients receiving long-term intrathecal analgesia should undergo periodic radiographic surveillance [16]. However, due to the low incidence of mass formation developing at the tip of intrathecal catheters, routine imaging to identify granulomas is not

indicated [15]. Only if correlated with the symptoms mentioned above, especially by bolus application. In the presented case we hypnotize that the catheter was initially placed intradurally which has been proven by fluoroscopy after intrathecal application of contrast agent through the catheter, at the time of initial catheter placement. Also the fact that the analgetic effect was sufficient over months supports this hypothesis. The catheter tip must have migrated through the dura into the epidural space at the level where the epidural granuloma mass has been found together with the encased catheter tip at the time of surgical revision. This led to a loss of therapeutic effect and a need for increase of opioid dosage. It is not clear which pathomechanism led to dural laceration and transdural migration of the catheter tip. Also the place of dural laceration could not be visualized during surgery, probably because it was covered by remnant granuloma wall adherent to the dura, which has been left intentionally. The literature concerning the pathomechanisms of catheter dislocation is scarce. Extensive patient movements especially inclination and reclination [17], or muscle spasms [18] are thought to be causing factors.

In conclusion, a case is presented with a patient suffering from spinal cord compression from an inflammatory lesion. What makes this case so special, is the fact that the granuloma is not located intrathecally, but in the epidural space.

At this time, no reports about epidural granulomas caused by intrathecal drug administration are described in literature. Therefore, this seems to be an even less frequent complication than the before mentioned intrathecal granulomas. Physicians should be vigilant to the early symptoms and signs of spinal cord compression, such as new neurological deficits, myelopathy or radiculopathy.

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