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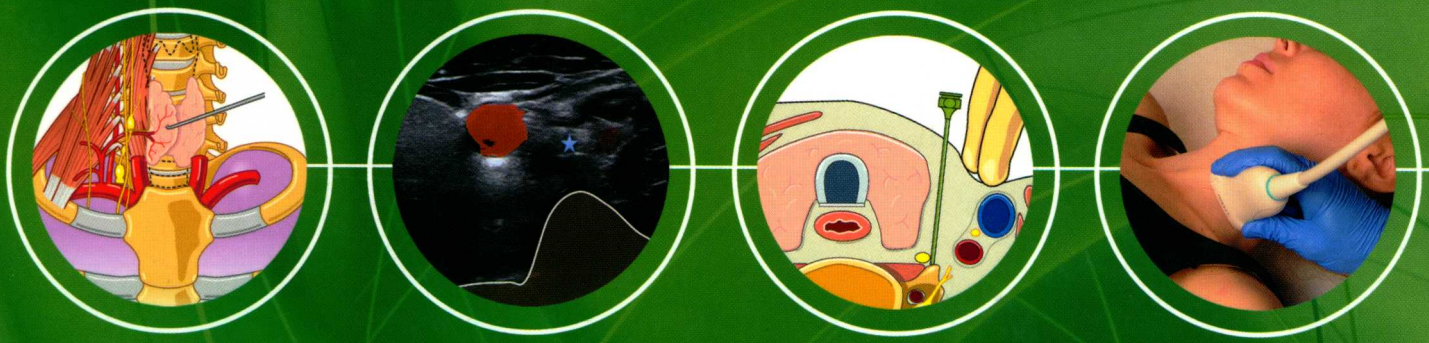

Atlas of INTERVENTIONAL PAIN MANAGEMENT

FOURTH EDITION

ELSEVIER

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Atlas of Interventional Pain Management

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ATLAS OF INTERVENTIONAL PAIN MANAGEMENT, FOURTH EDITION ISBN: 978-0-323-24428-2

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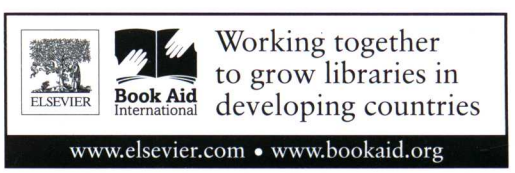
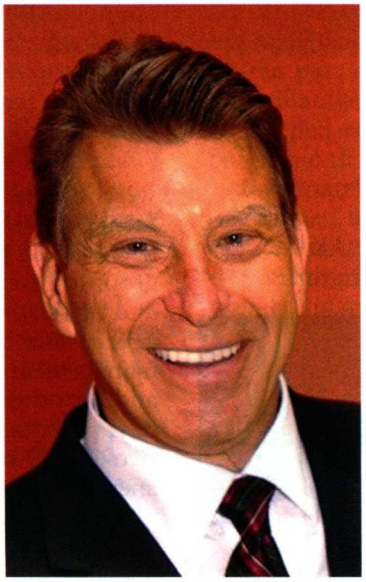
International Standard Book Number: 978-0-323-24428-2

Content Strategist: Michael Houston
Content Development Specialist: Laura Schmidt
Publishing Services Manager: Catherine Jackson
Design Direction: Ellen Zanolle

Printed in China

Last digit is the print number: 9 8 7 6 5 4 3 2 1





This book is dedicated to Dr. Steven Barag…….. dear friend, mentor, philosopher, clinician, teacher, comedian, and the only guy I know who can wear an ascot and actually pull it off!

Steve#2

Fall 2014

PREFACE

Milepost 25

—Mission Drift.....Course Correction.....AKA.....
Girls You Gotta Know When It's Time to Turn the Page—

1st Interventional Pain Management Meeting in Nice, France, 1992. Left to right, Steven D. Waldman, MD, Ronald Melzack, PhD, and Alon Winnie, MD.

Since it is often said that pain is as old as man, it would seem that the meeting of a couple of hundred physicians with an interest in using invasive techniques to treat pain is hardly worth mentioning. However, it was at this meeting in Nice, France, organized by Alon Winnie and me, that a new subspecialty of pain medicine was born: interventional pain management. This specialty devoted its efforts to the use of neural blockade, implantable technologies, and neurodestructive procedures to treat pain. This is not to say that before this meeting, physicians were not using invasive techniques to treat pain, but rather that this was the first time many of those physicians got together in an organized fashion and began to define the subspecialty that we now refer to as *interventional pain management*.

As I noted in the Preface to the third edition of *Atlas of Interventional Pain Management*, I came up with the term *interventional pain management* as a way to signal to potential attendees that this meeting would be about invasive procedures rather than about pills, hypnosis, biofeedback, and behavioral modalities, all of which were *de rigueur* at the time. Truth be told, at the meeting some suggested that "invasive pain management" would be a better name for our new subspecialty. Fortunately or not, depending on how you look at it, that name did not stick, so here were are today.

To put this ancient history in the proper context, it is useful to look at where the specialty of pain management was back in those dark ages—before the advent of cell phones, personal computers, and Viagra—a time when most of the discussion surrounding pain treatment centered on tricyclic antidepressants, major tranquilizers, anticonvulsants, biofeedback, and behavior modification.

Wait, you say! There was no specialty of pain management at that time, at least insofar as organized mainstream medicine was concerned! Twenty-five years ago there were no organized training programs for pain management (with the exception of a few unofficial and uncertified training programs that were run by a rather eccentric group of anesthesiologists including Raj, Racz, Winnie, and myself), let alone any real fellowships. At that time, a very few of us devoted our practices solely to pain management. For most, pain management was a sideline, and for others it was an unwelcome interruption to their day; practitioners would grudgingly do a nerve block or two in the recovery room after spending a day giving anesthesia in the operating room. You might ask, what about the physical medicine and rehabilitation (PM & R) doctors and neurologists? They did not arrive on the pain management scene until much later.

The first "official" examinations in pain management were not held until 1993. I remember flying to Chicago along with about 250 other "grandfathered" anesthesiologists to sit for a 3-hour written examination that was made up primarily of questions written by those of us who were taking the examination. It is hard to believe that although we wrote most of our own questions, the pass rate for this examination was only about 80%! Those of us who passed were awarded the dubious distinction of having qualified for a *Certificate of Added Qualification in Pain Management* by the American Board of Anesthesiology. To be honest, no one was clear on what that really meant or whether it was even worth listing on one's curriculum vitae.

Fast forward to 2015 and you will find that our specialty has come up in the world. Pain Medicine (its name had been changed from Pain Management in 2002) is now recognized by the American Board of Medical Specialties as a specialty worthy of its own full subspecialty board certification, a board certification that can be reached only after completing a 4-year residency in anesthesiology, physical medicine and rehabilitation, neurology, and so forth; completing a 1- to 2-year fellowship in pain medicine; and then passing a rigorous written examination. We have traveled quite a distance in 25 years, but these years have not been without growing pains, some good and some not so good.

As the body of knowledge of interventional pain management began to become codified by the publishing of the first books in our specialty, such as Raj's *Practical Management of Pain* and my textbooks *Interventional Pain Management* and the *Atlas of Interventional Pain Management Techniques*, organized fellowships in pain management began appearing. These training programs grew in both scope and stature; as a result, a critical mass of qualified interventional pain management specialists became available to care for the patient in pain. Interventional pain management procedures became the gold standard for pain treatment. As with most good things, some interventional pain management specialists, myself included, adopted the mantra that *if a little was good,*

more was better. To borrow a term from Alan Greenspan, there was a *"frothy, irrational exuberance"* insofar as interventional pain management procedures were concerned. Many interventional pain management specialists bragged that "there was no place in the body that they couldn't put a needle!" Fortunately, as the specialty evolved, so did its practitioners, and with the help of new professional organizations such as the Society For Pain Practice Management, the American Society of Regional Anesthesia, and later the American Society of Interventional Pain Physicians under the tireless leadership of Lax Manchicanti, interventional pain specialists began to promulgate guidelines for best practices for our specialty and to the benefit of our patients.

However, there was trouble in paradise. As the result of a paper based on only 38 patients published by Portenoy and Foley, many interventional pain management specialists (along with the rest of the medical community) were told that opioids—specifically Oxycontin and the like—were the panacea we were all looking for when treating the patient in pain. Interventional pain management specialists were admonished: "How dare you stick a needle in a patient suffering from back pain." Portenoy and Foley concluded that *"opioid maintenance therapy can be a safe, salutary and more humane alternative to the options of surgery or no treatment in those patients with intractable non-malignant pain and no history of drug abuse."* After all, we were told, pain was the *fifth vital sign* and the medical community was roundly chastised that it was being grossly undertreated. Many in our specialty drank the *"opioid for non-malignant pain Kool Aid"* and eschewed the time-proven beneficial procedures of interventional pain management, choosing instead to reach for the prescription pad. For a time, a feeling of guilt pervaded our specialty, especially whenever one of us picked up a needle or scalpel, and a Dark Ages of sort descended on interventional pain management. These guilt-ridden dark years dragged on as a relentless campaign gathered momentum, a campaign organized and funded by pharmaceutical companies to promote the use of opioids for chronic nonmalignant pain. Physicians were told that "opioids were a gift from nature," and the few holdouts who refused to yield to this viewpoint were accused of suffering from opiophobia. Even the State Federation of Medical Boards and the Joint Commission yielded to this stealth program organized and financed by "big pharma" to sell opioids and jumped on the bandwagon. It seems that our specialty was at risk for obsolescence. It was indeed a dark time. To quote Thomas Paine, *"A long habit of not thinking a thing wrong gives it a superficial appearance of being right."* Although many knew in their hearts that the use of opioids as a first-line treatment for chronic nonmalignant pain was wrong, few spoke up. This silence on the part of organized medicine, and our specialty in particular, led to a public health disaster that could only be likened to the Black Plague of the Middle Ages, a pandemic that ultimately harmed millions of people!

Fortunately, good triumphed over evil. As the deaths and ruined lives resulting from the inappropriate use of opioids mounted, a few voices within our specialty began to speak out against opioids, and once again interventional pain management specialists are putting away their prescription pads and turning to interventional procedures to treat their patients.

Helping fuel this renewed enthusiasm for interventional pain management modalities has been the arrival of a totally unrelated development: the use of ultrasound guidance. Just as improvements in needle technology and implantable devices helped fuel the early growth of our specialty, huge improvements in ultrasound technology, both in terms of image resolution and ease of use, have made performing many interventional pain management procedures easier and safer for both the pain management specialist and the patient. Although time and experience will help define exactly where ultrasound fits within the practice of interventional pain management, I believe that most will agree that this imaging modality has been a great asset for our specialty.

About this fourth edition of *Atlas of Interventional Pain Management,* a little information is in order. In its first three editions, the *Atlas of Interventional Pain Management* has enjoyed enormous success, becoming the largest selling pain management text currently in print. The various editions have been translated into more than 15 languages and have been a mainstay of education for a generation of interventional pain management physicians. My colleagues at Elsevier and I are very proud of these facts and have endeavored to make this fourth edition the best one yet. I have added 18 new chapters and more than 200 new full-color figures, and have greatly expanded information on the use of ultrasound guidance. The addition of over 100 how-to-do-it sections on ultrasound-guided interventional pain management techniques that are richly illustrated with full-color photographs showing transducer placement, patient positioning, and clearly marked ultrasound images should make this fourth edition of *Atlas of Interventional Pain Management* better than ever.

As always, I hope you enjoy reading and using this text as much as I enjoyed writing it!

Steven D. Waldman, MD, JD

Fall 2014

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Chapter available on Expert Consult.

VIDEO CONTENTS

SECTION I

HEAD

CHAPTER 1

Atlanto-occipital Block Technique

CPT-2015 Code	
First Joint	64490
Second Joint	64491
Third and Any Additional Joint	64492
Neurolytic First Level (Two Nerves)	64633

Relative Value Units	
First Joint	12
Second Joint	12
Each Additional Joint	12
Neurolytic First Level (Two Nerves)	30

INDICATIONS

Atlanto-occipital block is useful in the diagnosis and treatment of painful conditions involving trauma or inflammation of the atlanto-occipital joint. These problems manifest clinically as neck pain, preauricular pain, and/or suboccipital headache pain and occasionally as suboccipital pain that radiates into the temporomandibular joint region. The patient may note an increase in pain when the joint is placed at extreme ranges of motion and may also experience associated nausea, difficulty concentrating, and sleep disturbance due to an inability to find a comfortable position when supine.

CLINICALLY RELEVANT ANATOMY

The atlanto-occipital joint is dissimilar to the functional units of the lower cervical spine. The joint is not a true facet joint because it lacks posterior articulations characteristic of a true zygapophyseal joint. The atlanto-occipital joint allows the head to nod forward and backward with an isolated range of motion of about 35 degrees. This joint is located anterior to the posterolateral columns of the spinal cord. Neither the atlas nor the axis has an intervertebral foramen to accommodate the first or second cervical nerves. These nerves are primarily sensory and, after leaving the spinal canal, travel through muscle and soft tissue laterally and then superiorly to contribute fibers to the greater and lesser occipital nerves.

The atlanto-occipital joint is susceptible to arthritic changes and trauma secondary to acceleration-deceleration injuries. Such damage to the joint results in pain secondary to synovial joint inflammation and adhesions.

The atlanto-occipital joint is different from the functional units of the lower cervical spine in that the joint is not a true facet joint because it lacks posterior articulations characteristic of a true zygapophyseal joint. The atlanto-occipital joint is susceptible to arthritic changes and trauma secondary to acceleration-deceleration injuries. Atlanto-occipital block is useful in the diagnosis and treatment of painful conditions involving trauma or inflammation of the atlanto-occipital joint. These problems manifest clinically as neck pain, preauricular pain, and/or suboccipital headache pain and occasionally as suboccipital pain that radiates into the temporomandibular joint region.

TECHNIQUE

Fluoroscopically Guided Technique

Atlanto-occipital block is usually done under fluoroscopic guidance because of the proximity of the joint to the spinal cord and vertebral artery, although some pain management specialists have gained sufficient familiarity with the procedure to perform it safely without fluoroscopy. The patient is placed in a prone position. Pillows are placed under the chest to allow moderate flexion of the cervical spine without discomfort to the patient. The forehead is allowed to rest on a folded blanket.

If fluoroscopy is used, the beam is rotated in a sagittal plane from an anterior to a posterior position, which allows identification and visualization of the foramen

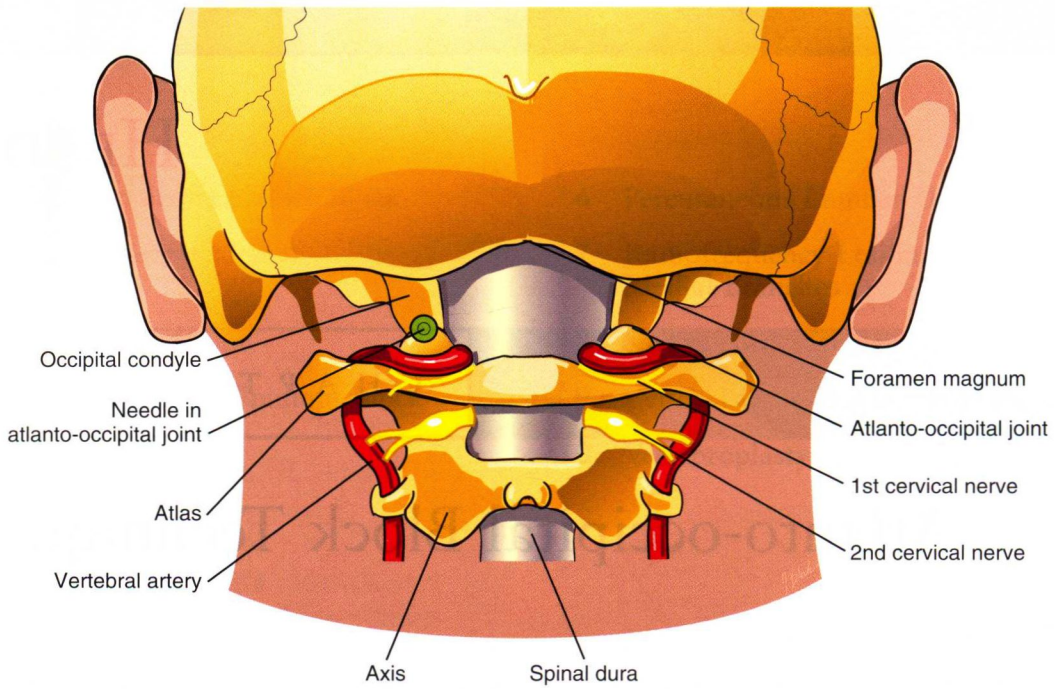

Figure 1-1 Anatomy of the atlanto-occipital joint.

magnum. Just lateral to the foramen magnum is the atlanto-occipital joint. A total of 5 mL of contrast medium suitable for intrathecal use is drawn up in a sterile 12-mL syringe. Then 3 mL of preservative-free local anesthetic is drawn up in a separate 5-mL sterile syringe. When the pain being treated is thought to be secondary to an inflammatory process, a total of 40 mg of depot-steroid is added to the local anesthetic with the first block, and 20 mg of depot-steroid is added with subsequent blocks.

After preparation of the skin with antiseptic solution, a skin wheal of local anesthetic is raised at the site of needle insertion. An 18-gauge, 1-inch needle is inserted at the site to serve as an introducer. The fluoroscopy beam is aimed directly through the introducer needle, which appears as a small point on the fluoroscopy screen. The introducer needle is then repositioned under fluoroscopic guidance until this small point is visualized over the posterolateral aspect of the atlanto-occipital joint (Figs. 1-1 and 1-2). This lateral placement avoids trauma to the vertebral artery, which lies medial to the joint at this level.

A 25-gauge, 3½-inch styletted spinal needle is then inserted through the 18-gauge introducer. If bony contact is made, the spinal needle is withdrawn and the introducer needle is repositioned over the lateral aspect of the joint. The 25-gauge spinal needle is then readvanced until a pop is felt, indicating placement within the atlanto-occipital joint. It is essential then to confirm that the needle is actually in the joint, which is anterior to the posterolateral aspect of the spinal cord (Fig. 1-3). This is accomplished by rotating the C-arm to the horizontal plane and confirming needle placement within the joint. If intra-articular placement cannot be confirmed, the needle should be withdrawn.

After confirmation of needle placement within the atlanto-occipital joint, the stylet is removed from the 25-gauge spinal needle, and the hub is observed for blood or cerebrospinal fluid. If neither is present, gentle aspiration of the needle is carried out, and if no blood or cerebrospinal fluid is seen, 1 mL of contrast medium is slowly injected under fluoroscopy. An arthrogram of the normal atlanto-occipital joint reveals a bilateral concavity representing the intact joint capsule. However, if the joint has been traumatized, it is not unusual to see contrast medium flow freely from the torn joint capsule into the cervical epidural space. If the contrast medium is seen to

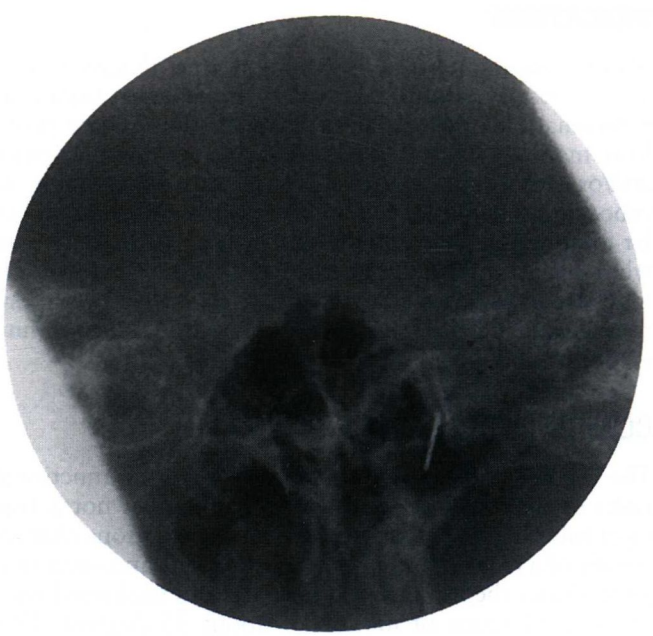

Figure 1-2 Fluoroscopic view of the needle over the posterolateral aspect of the atlanto-occipital joint.

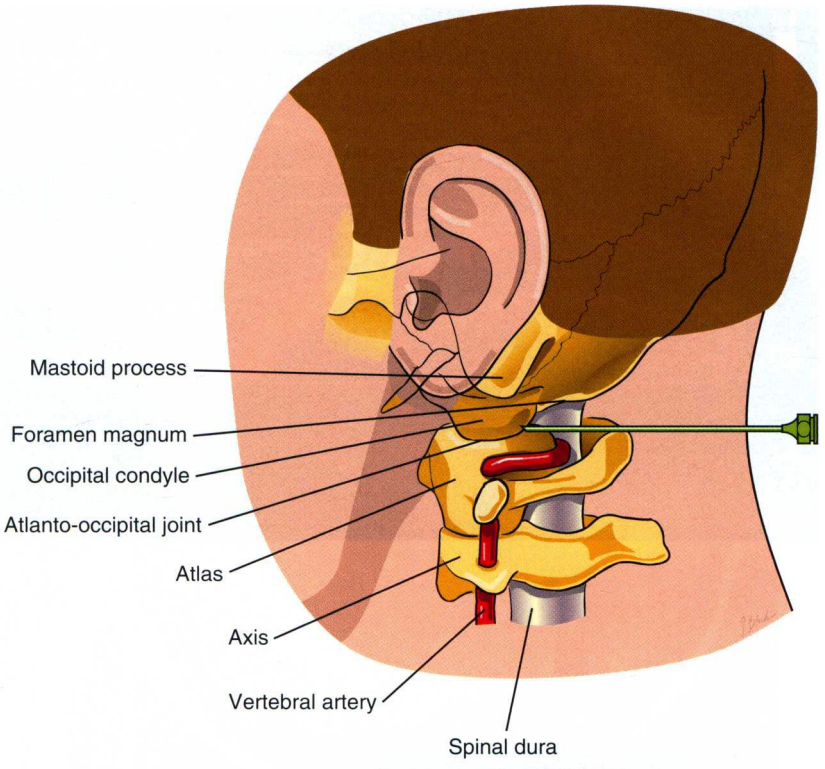

Figure 1-3 Lateral view of the placement of the needle into the atlanto-occipital joint.

rapidly enter the venous plexus rather than outline the joint, the needle is almost always not within the joint space. If this occurs, the needle should be repositioned into the joint before injection. If the contrast medium remains within the joint or if it outlines the joint and a small amount leaks into the epidural space, 1 to 1.5 mL of the local anesthetic and steroid is slowly injected through the spinal needle.

Ultrasound-Guided Technique

The patient is placed in a prone position. Pillows are placed under the chest to allow moderate flexion of the cervical spine without discomfort to the patient. The forehead is allowed to rest on a folded blanket. After preparation of the skin overlying the injection site with antiseptic solution, a high-frequency linear ultrasound transducer is placed slightly off the midline in a transverse position (Fig. 1-4). The vertebral artery is then identified as it passes through the transverse vertebral foramen. Color Doppler imaging may assist in identification (Fig. 1-5). After the artery is identified, it is traced cranially under real-time ultrasound imaging until the artery is seen to turn medially in front of the atlanto-occipital joint (Fig. 1-6). The atlanto-occipital joint is identified, and at a point just lateral to the angle of the turn of the vertebral artery, a 22-gauge, 3½-inch spinal needle is carefully advanced under real-time ultrasound guidance into the atlanto-occipital joint (Fig. 1-7).

Figure 1-4 The patient is placed in a prone position with the cervical spine slightly flexed and the forehead placed on a folded towel. A high-frequency linear ultrasound transducer is placed slightly off the midline in a transverse position.

SIDE EFFECTS AND COMPLICATIONS

The proximity to the brain stem and spinal cord makes it imperative that this procedure be carried out only by

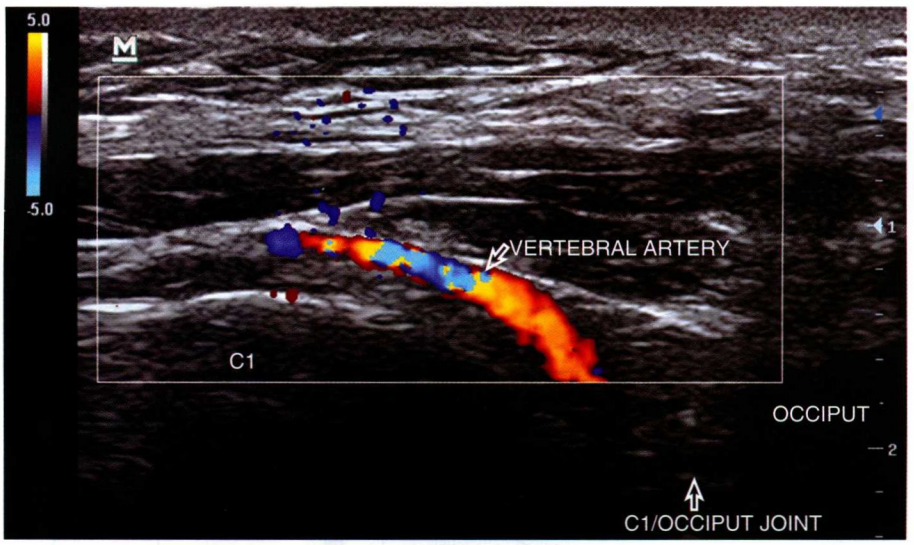

Figure 1-5 Color Doppler image of the vertebral artery demonstrating how it turns medially in front of the atlanto-occipital joint.

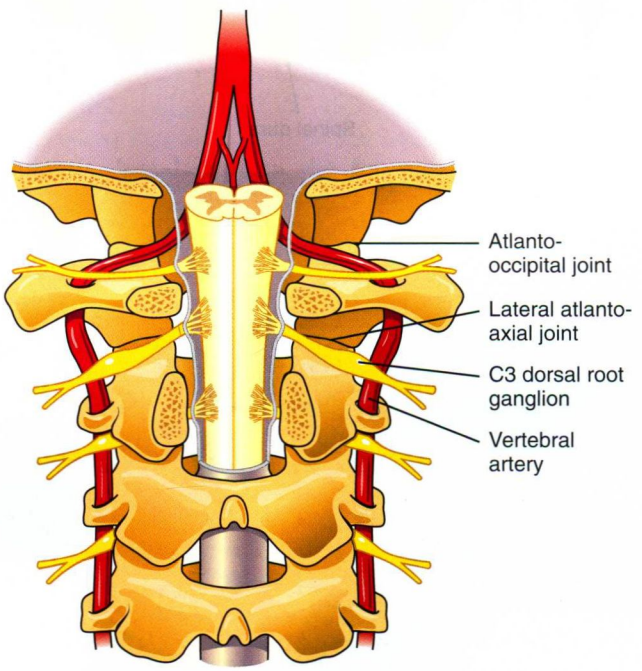

Figure 1-6 The vertebral artery passes cranially through the transverse vertebral foramen. It turns medially toward the midline. The atlanto-occipital joint lies just in front of the turning vertebral artery.

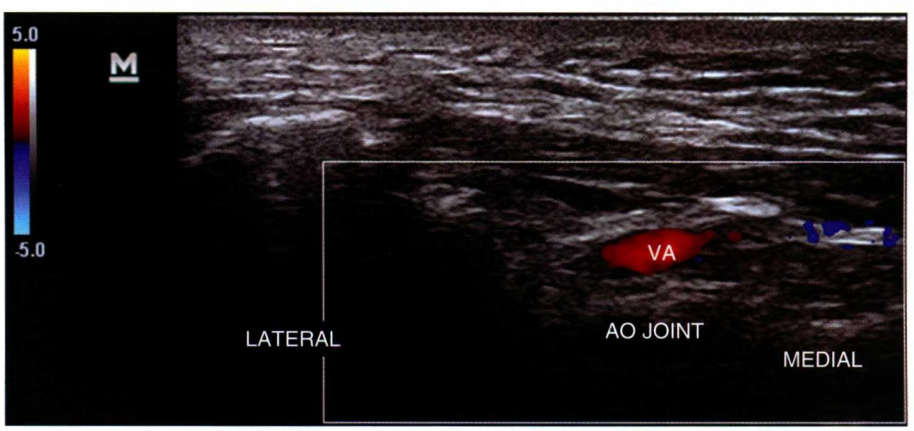

Figure 1-7 Ultrasound image demonstrating the relationship of the vertebral artery (VA) to the atlanto-occipital (AO) joint.

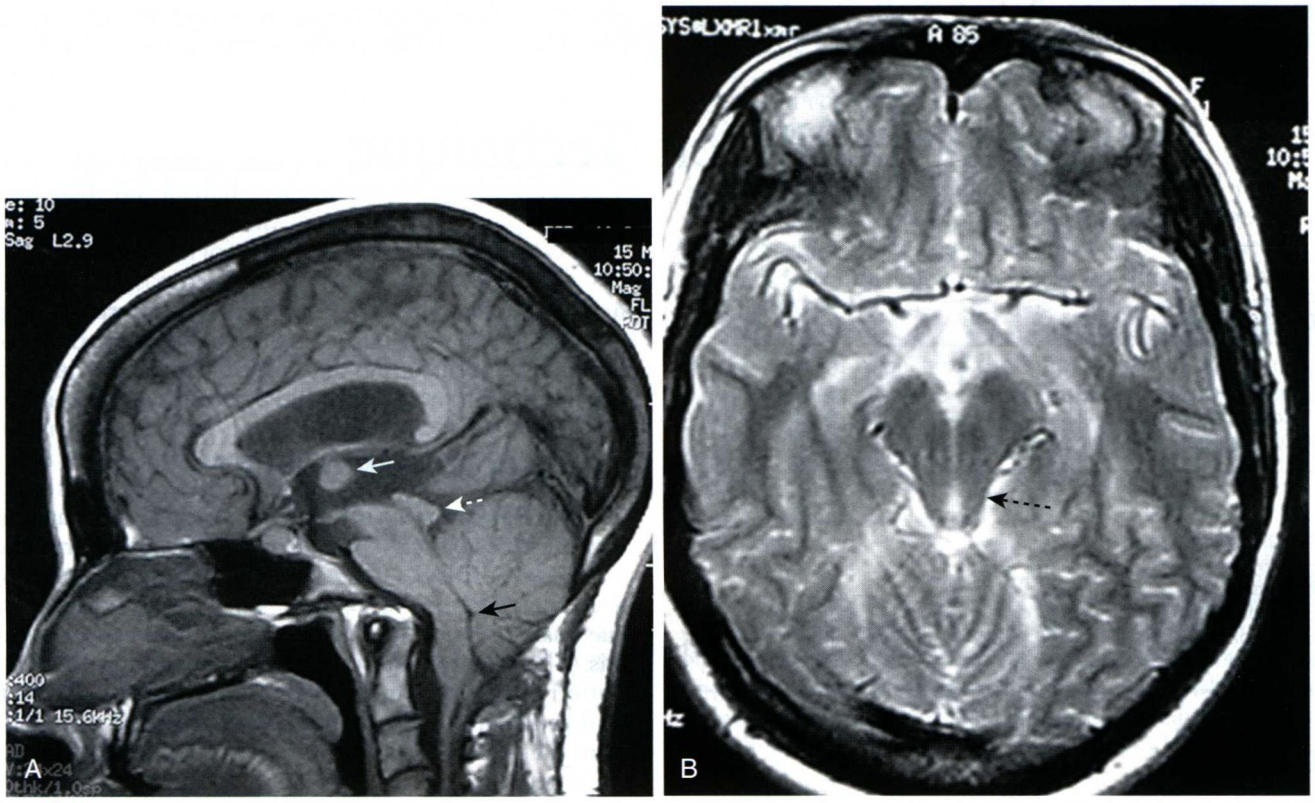

Figure 1-8 **A,** Sagittal T1-weighted (T1W) magnetic resonance (MR) image of an adult patient with Arnold-Chiari type II deformity. The posterior fossa is small with a widened foramen magnum. There is inferior displacement of the cerebellum and medulla with elongation of the pons and fourth ventricle *(black arrow)*. The brain stem is kinked as it passes over the back of the odontoid. There is an enlarged massa intermedia *(solid white arrow)* and beaking of the tectum *(dashed white arrow)*. **B,** Axial T2W MR image showing the small posterior fossa with beaking of the tectum *(dashed black arrow)*. *(From Waldman SD, Campbell RSD: Arnold-Chiari malformation type II. In Imaging of Pain. Philadelphia, Saunders, 2011, pp 29-30, Fig 9.1,* A *and* B.*)*

those well versed in the regional anatomy and experienced in performing interventional pain management techniques. Fluoroscopic guidance is recommended for most practitioners because neural trauma is a possibility even in the most experienced hands. The proximity to the vertebral artery, combined with the vascular nature of this anatomic region, makes the potential for intravascular injection high. Even small amounts of local anesthetic injected into the vertebral arteries will result in seizures. Given the proximity of the brain and brain stem, ataxia after atlanto-occipital block due to vascular uptake of local anesthetic is not an uncommon occurrence.

Clinical Pearls

Atlanto-occipital block is often combined with atlantoaxial block when treating pain in the previously mentioned areas. Although neither joint is a true facet joint in the anatomic sense of the word, the block is analogous to the facet joint block technique used commonly by pain practitioners and may be viewed as such. Many pain management specialists believe that these techniques are currently underused in the treatment of so-called postwhiplash cervicalgia and cervicogenic headaches. These specialists believe that both techniques should be considered when cervical epidural nerve blocks and occipital nerve blocks fail to provide palliation of these headache and neck pain syndromes.

Any patient being considered for atlanto-occipital nerve block should undergo magnetic resonance imaging (MRI) of the head to rule out unsuspected intracranial and brain stem disease (Fig. 1-8). Furthermore, MRI of the cervical spine should be considered to rule out congenital abnormalities such as Arnold-Chiari malformations or posterior fossa tumors that may be the hidden cause of the patient's headache symptoms.

It should be noted that in some patients, the course of the vertebral artery covers the entire atlanto-occipital joint, which makes needle placement impossible. In such patients, a trial of occipital nerve stimulation may be a reasonable consideration.

CHAPTER 2

Atlantoaxial Block Technique

CPT-2015 Code	
First Joint	64490
Second Joint	64491
Third and Additional Joints	64492
Neurolytic First Level (Two Nerves)	64633

Relative Value Units	
First Joint	12
Second Joint	12
Each Additional Joint	12
Neurolytic First Level (Two Nerves)	30

INDICATIONS

Atlantoaxial block is useful in the diagnosis and treatment of painful conditions involving trauma or inflammation of the atlantoaxial joint. These problems may manifest clinically as neck pain or suboccipital headache pain and occasionally as suboccipital pain that radiates into the temporomandibular joint region and is worsened with rotation of the joint. The patient may note an increase in pain when the joint is placed at extreme ranges of motion and may also experience associated nausea, difficulty concentrating, and sleep disturbance due to an inability to find a comfortable position when supine.

CLINICALLY RELEVANT ANATOMY

The atlantoaxial joint is dissimilar to the functional units of the lower cervical spine. The joint is not a true facet joint because it lacks posterior articulations characteristic of a true zygapophyseal joint. Furthermore, there is no true disk or intervertebral foramen between atlas and axis. The atlantoaxial joint allows the greatest degree of motion of all the joints of the neck: it not only allows the head to flex and extend about 10 degrees but also allows more than 60 degrees of rotation in the horizontal plane. The integrity and stability of the atlantoaxial joint are almost entirely ligamentous in nature. Even minor injury of the ligaments due to trauma can result in joint dysfunction and pain. Severe disruption of the ligaments has the same effect as a fracture of the odontoid process and can result in paralysis and death.

This joint is located lateral to the posterolateral columns of the spinal cord (Fig. 2-1). Neither the atlas nor the axis

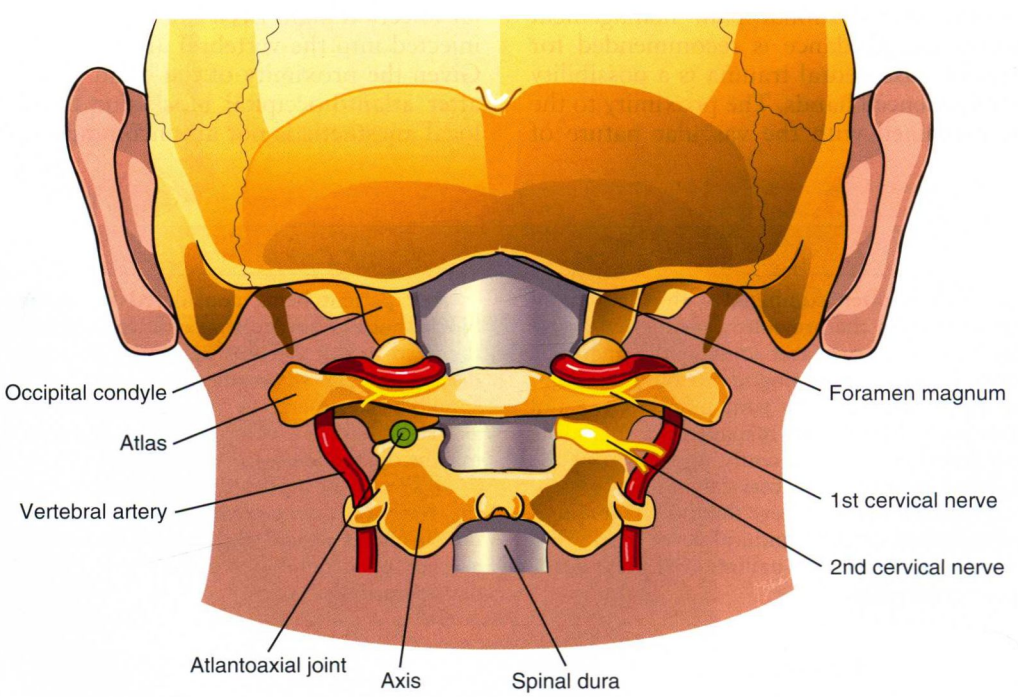

Figure 2-1 Anatomy of the atlantoaxial joint.