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DOI
10.1097/EJA.0b013e328324044e
Publication date
2009
Document Version
Final published version
Published in
European journal of anaesthesiology

Effective plexus anaesthesia in a patient with Ehlers–Danlos syndrome type III

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Received 6 November 2008 **Revised** 19 November 2008
Accepted 26 November 2008

Editor,

Ehlers–Danlos syndrome type III (also called hypermobility type) is an autosomal dominant-inherited disease of the connective tissue with an incidence of 1 : 150 000 [1]. Although defects in the genes encoding for procollagen III (COL3A1) or tenascin-X (TNXB) have been suggested as possible candidates, up to now the precise defect for this genetic disease remains unknown [2]. From an anaesthesiologist's point of view, the most important features in patients with Ehlers–Danlos syndrome are vessel fragility, poor skin healing, excessive bleeding, spontaneous pneumothorax, joint dislocation including vertebral instability, valvular prolapse and – in type IV – spontaneous dissections and ruptures of major vessels. Thus, the vessel fragility and successive bleeding as well as scoliosis may be a relative contraindication against regional anaesthesia in favour of general anaesthesia, whereas cervical spine joint laxity, skin fragility, an increased risk of temporomandibular joint dislocation, laryngeal trauma and pneumothorax may push the pendulum back in the direction of regional anaesthesia. Furthermore, there have been studies showing that subcutaneous infiltration of lidocaine has a reduced time of action and that transcutaneous application of a eutectic mixture of lidocaine 2.5% and prilocaine 2.5% (EMLA, AstraZeneca, Södertälje, Sweden) did not produce sufficient analgesia [3]. Additionally, patients with benign joint hypermotility syndrome (incidence 1 : 10 000), a syndrome with clinical features overlapping with those of Ehlers–Danlos syndrome type III, and a possibly similar genetic background [2] report an increased ratio of local anaesthesia failure compared with controls [4]. In contrast to these observations, there have been case reports of successful epidural and spinal anaesthesia in patients with Ehlers–Danlos syndrome [5–7].

To our knowledge, there are no reports on peripheral nerve blocks in patients with Ehlers–Danlos syndrome. This would be interesting, especially in patients with Ehlers–Danlos syndrome type III, as, in these patients, the 'possibility of a resistance to local anaesthetics' has been stated [4]. Furthermore, these patients undergo repeated operations for their unstable joints, and it would be valuable to have knowledge about the possibility of peripheral nerve blockades in these patients.

Case report

A 56-year-old female patient was scheduled to undergo a repeated arthroplasty of her left carpometacarpal joint. She was known to have a mitral valve prolapse, had

undergone an anterior cervical hernia operation C5/6 and C6/7 and was treated for arterial hypertension. She had been diagnosed with Ehlers–Danlos syndrome type III on clinical grounds several years earlier and had undergone several orthopaedic, traumatologic and plastic surgeries in the past. She had undergone surgery on her wrists four times under brachial plexus blockade anaesthesia. On detailed questioning, she reported that all regional blocks were sufficient and did wear off within reasonable time. Review of the anaesthesia files revealed that she had had an axillary block twice and a vertical infraclavicular block twice: all of them had been done within the previous 2 years with the help of a nerve stimulator. On three occasions she had received 40 ml mepivacaine 1.5% with epinephrine 1 : 200 000 and on the fourth occasion 30 ml levobupivacaine 0.375% for an axillary block. One axillary block had to be supplemented by a distal radial nerve block at the level of the elbow with 10 ml lidocaine 1%. Furthermore, all blockades were successful, and the operations had been performed without additional sedation or analgesia. The blockades with mepivacaine wore off 4–5 h after the injection while the patient was still in the recovery unit, whereas the blockade with levobupivacaine lasted 6–8 h. Thus, she had a completely normal history of peripheral nerve blockades with a typical duration of blocks.

In contrast, she admitted that, during several dental procedures, the local anaesthetic effect (articaine) was of rather unusual short duration of approximately 15 min according to her dentist. It was her explicit wish to undergo a further hand operation under regional anaesthesia, because she had had a bad experience with urinary retention after an earlier general anaesthesia. Therefore, she gave informed consent for a supraclavicular blockade with a peripheral nerve catheter for postoperative pain therapy and publication of the case.

Thus, we performed a brachial plexus blockade under ultrasound guidance (12 MHz linear probe, LOGIQ e, GE Medical Systems, China) via a supraclavicular approach using an in-plane technique. The brachial plexus could be identified above the subclavian artery and above the first rib. With an in-plane technique, the cannula was visualized the whole time and the spread of local anaesthetic checked and accordingly adjusted. Twenty millilitres of mepivacaine 2% was injected through the needle and then catheter advanced 3 cm above the tip of the needle (Contiplex D; B. Braun, Melsungen, Germany). Finally, the correct positioning of the catheter was checked by a test injection of a minuscule air bubble to visualize the end of the catheter and 1 ml lidocaine 1% in order to check adequate spread of the local anaesthetic around the plexus. Although contact with all visible vessels was avoided, there was some bleeding from the puncture site necessitating a local compression for a couple of minutes. Thereafter, no further bleeding or swelling was seen.

The brachial plexus was blocked completely within 15 min, and the patient underwent the operation without any additional sedation or analgesia. She received satisfactory postoperative pain therapy via the brachial plexus catheter for 36 h (bupivacaine 0.125% with an infusion rate of 6 ml h^{-1}, visual analogue scale at all times <20%) without any additional rescue medication and went home pain free on the second postoperative day.

Discussion

This is the first description of peripheral nerve blocks in a patient with Ehlers–Danlos syndrome. The case shows that peripheral regional anaesthesia is an option in these patients making the 'possibility of resistance to local anaesthesia' [4] in this patient group unlikely.

Ehlers–Danlos syndrome is a heterogeneous group of inherited diseases characterized by abnormal connective tissue. Because of the life-threatening fragility of the great vessels in type IV, this form has received considerable attention from anaesthesiologists [7,8]. In contrast, type III has received little interest, though a reduced efficacy of local anaesthetics could be demonstrated. The infiltration anaesthesia with lidocaine is shortened and, with a eutectic mixture of lidocaine and prilocaine, sufficient analgesia could not be reached. Furthermore, 58% of patients with benign joint hypermobility syndrome (which is regarded by some authorities as identical to Ehlers–Danlos type III [2,9]) reported experiencing an ineffective local anaesthesia in the past, whereas this was reported by only 21% of the matched controls [4]. Thus, at least with transcutaneous and subcutaneous infiltration of local anaesthetics, there is a reduced efficacy. This may be due to the altered texture of the cutaneous and subcutaneous connective tissue leading to a faster spread or systemic resorption or both of local anaesthetics. In contrast, case reports have documented a normal effectiveness during spinal and epidural anaesthesia [5,7]. To our knowledge, this is the first case report of four successful plexus brachialis blockades of normal duration in a patient with Ehlers–Danlos syndrome type III. Possibly in these locations, the distribution and or resorption of local anaesthetics are unaltered through the abnormal connective tissue. Certainly, the nerves of patients with Ehlers–Danlos type III or benign joint hypermobility syndromes are not 'resistant' to local anaesthetics as stated by some authors [4]. All voltage-gated sodium channels of eukaryotes have a highly conserved region that binds to local anaesthetics [10]. Beyond that, the genetic variations suggested to induce Ehlers–Danlos syndrome type III (mutations in procollagen III or in tenascin-X) have no influence on the sensitivity of the voltage-gated sodium channel. Thus, the reason for the decreased effectiveness of

transcutaneous or subcutaneous local anaesthesia is likely to be an altered pharmacokinetics rather than a change in pharmacodynamics.

Another problem in patients with Ehlers–Danlos syndrome is the fragility of blood vessels and the pleurae. Nowadays, injury to sensitive surrounding structures such as great vessels or the pleura may be avoided by the use of ultrasound-guided regional anaesthesia [11]. Naturally, damage to small vessels cannot be avoided and, therefore, our patient had a minor bleed next to the catheter at the end of the procedure. We chose an ultrasound-guided supraclavicular in-plane approach, because supraclavicularly the plexus brachialis is most superficial to the skin and the cannula can be visualized the whole way with minimal tissue damage. Furthermore, the neural structures are very compact there, avoiding multiple redirection of the needle as, for example, with an axillary approach. However, with an ultrasound-guided technique, the chance of injuring sensitive structures can only be lower but may never be avoided completely.

In conclusion, peripheral nerve blocks in a patient with Ehlers–Danlos syndrome type III worked as effectively as in normal persons, whereas infiltration anaesthesia – as described in the literature – is less effective. Ultrasound-guided regional anaesthesia may help to avoid injury to vessels or the pleurae, which are extremely fragile structures in these patients.

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DOI:10.1097/EJA.0b013e328324044e