

Endoscopic Resection of Chronic Morel–Lavallée Lesion of the Knee



Yi Lok Charis Chan, M.B.B.S (H.K.), and
Tun Hing Lui, M.B.B.S. (H.K.), F.R.C.S. (Edin.), F.H.K.A.M., F.H.K.C.O.S.

Abstract: The Morel–Lavallée lesion is a closed internal soft-tissue degloving injury. About 15.7% of Morel–Lavallée lesions occur in the knee region. Morel–Lavallée lesions are considered chronic when the lesion contains a capsule. The capsule prevents resorption of the fluid content, and the lesion will recur when using conservative treatment alone. Surgical debridement with resection of the capsule is a more definitive treatment option, but it may induce wound complications. In this Technical Note, the technical details of endoscopic resection of chronic Morel–Lavallée lesion of the knee are discussed. This minimally invasive technique has the advantage of better cosmetic results and fewer wound complications.

Morel–Lavallée lesion (MLL) is a closed internal soft-tissue degloving injury. It results from high-energy shearing forces, wherein the skin and subcutaneous tissue are separated from the underlying fascia.^{1,2} Disruption of bridging blood and lymphatic vessels leads to a collection of fluid in the plane created as a result of the injury. The fluid collection is frequently colonized during the incipient bacteremia that can follow a polytrauma. These infections can progress to abscess, cellulitis, symptoms of ongoing mass effect, and even deep bone infections.¹

In the normal tissue, vessels penetrating the fascia perfuse the skin. However, in a closed degloving injury, these vessels are disrupted. In this scenario, the skin can draw supply via the dermal and subcutaneous vascular plexus, but the risk of ischemic injury is increased.^{2,3}

Decreased cutaneous sensation often is associated with the skin over the area of degloving because of shearing injury to the cutaneous nerves.⁴

MLLs tend to occur in regions with relatively firm and immobile deep fascia, most often around the peritrochanteric or peripelvic region and the lower limb. Although MLLs in the pelvis and hips have been well described, their occurrence in the knee region has been reported.^{2,3,5-7} Overall, about 15.7% of MLLs occur in the knee region.⁶

In the majority of cases, MLLs spontaneously resolve; however, in those that don't, granulation tissue is thought to become organized into a pseudo-capsule preventing the resorption of fluid.³ The lesion can be managed according to the volume of the cavity created in the lesion, as well as its chronicity. Conservative therapy by compression, activity cessation, and/or rest, followed by close monitoring, is considered reasonable for acute lesions of limited size. For large, chronic or recalcitrant lesions, needle aspiration or drainage should be applied. Needle aspiration with immediate post-procedure compression bandaging to prevent refilling of the space should be applied for MLL with a volume of less than 50 mL. Recalcitrant cases may benefit from talc or doxycycline sclerodesis. A MLL with volume more than 50 mL of fluid is an indication for operative intervention.⁸ Surgical options include evacuation of the hemolymphatic collection with excision of the pseudocapsule and debridement of necrotic tissue. The wound may be left open with or without the assistance of a vacuum dressing or closed primarily with or without a drain in situ. Alternatively, synthetic glue

From the Department of Orthopaedics and Traumatology, North District Hospital, Sheung Shui, NT, Hong Kong SAR, China (T.H.L.); and Department of Orthopaedics and Traumatology, United Christian Hospital, Hong Kong (Y.L.C.C.).

The authors report that they have no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as [supplementary material](#).

Received March 11, 2021; accepted April 14, 2021.

Address correspondence to Dr. T. H. Lui, Department of Orthopaedics and Traumatology, North District Hospital, 9 Po Kin Rd., Sheung Shui, NT, Hong Kong SAR, China. E-mail: luithderek@yahoo.co.uk

© 2021 THE AUTHORS. Published by Elsevier Inc. on behalf of the Arthroscopy Association of North America. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

2212-6287/21429

<https://doi.org/10.1016/j.eats.2021.04.015>

Table 1. Indications and Contraindications of Endoscopic Resection of Chronic Morel–Lavallée Lesion of the Knee

Indications	Contraindications
Intractable chronic Morel–Lavallée lesion of the knee resistant to conservative treatment.	Operative-site cellulitis.
	Recurrence after previous surgery.
	Septic bursitis is considered to be a relative contraindication.

or quilting sutures can be used to close the dead-space intraoperatively or the use of aponeurotic fenestrations to allow active internal drainage and resorption by adjacent muscle fibers.^{6,9} No single technique has been identified as superior for acute MLL. Chronic MLLs are treated best with open resection of the fibrous capsule and débridement.¹⁰

MLL of the knee is more common at the medial side than lateral side of the knee.⁵ A MLL at the anterior or medial side of the knee has important implication to surgical management. Because the medial side of the knee and the upper part of the tibia are poorly vascularized and lack muscular attachments, skin and fat necrosis after open debridement of MLL in this anatomic region will result in total exposure of the tibia. Similarly, wound breakdown after open resection of MLL of the anterior knee will expose the underlying patella and patellar tendon. This will be very difficult to manage these soft tissue defects.⁵

The purpose of this technical note is to describe the details of endoscopic resection of chronic MLL of the knee which can reduce the risk of wound complication. It is indicated for intractable chronic MLL of the knee

resistant to conservative treatment. It is contraindicated if there is operative site cellulitis or recurrence after previous surgery. Septic lesion is considered to be a relative contraindication (Table 1).

Technique

Preoperative Planning and Patient Positioning

The diagnosis of chronic MLL of the knee is made on clinical grounds and confirmed with magnetic resonance imaging (MRI) (Fig 1) or ultrasound study.¹ MRI is the mainstay in diagnosis of MLL with presence of a thin peripheral ring that is hypointense on all sequences, representing a fibrous or hemosiderin-laden capsule, being the hallmark of the lesion. Given that MLLs are essentially a potential space containing blood, lymph, and debris, the lesions have a variable imaging appearance, which is largely dependent on the age of the internal blood products. The internal characteristics of the lesion can have varied appearances ranging from water-like signals appearing hyperintense on T2-weighted (T2W) and hypointense on T1-weighted (T1W) images in chronic MLL to being hyperintense on both T1W and T2W images representing extracellular methemoglobin, findings consistent with late subacute stage of hematoma. A third MRI pattern has also been reported for MLL, with variable signal intensity on T1W and heterogeneously hyperintense signals on T2W images. The lesion can show peripheral capsular and patchy internal enhancement, which is representative of capillary formation in the inner wall. Partial or complete septa as well as internal fluid levels can be seen.¹¹ The knee joint should be checked any associated pathology related to the initial injury. Computed tomogram is not recommended but can demonstrate fluid accumulation. It should be noted that

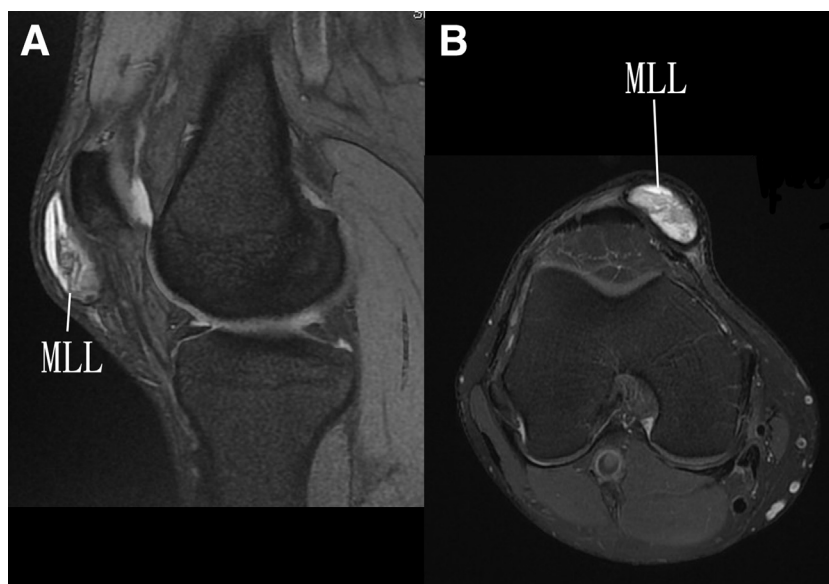


Fig 1. Endoscopic resection of chronic Morel–Lavallée lesion (MLL) of the right knee. The patient is in supine position with the legs spread. Magnetic resonance imaging of the illustrated case shows the MLL just superficial and medial to the patella and patellar tendon. (A) Sagittal image; (B) transverse image.

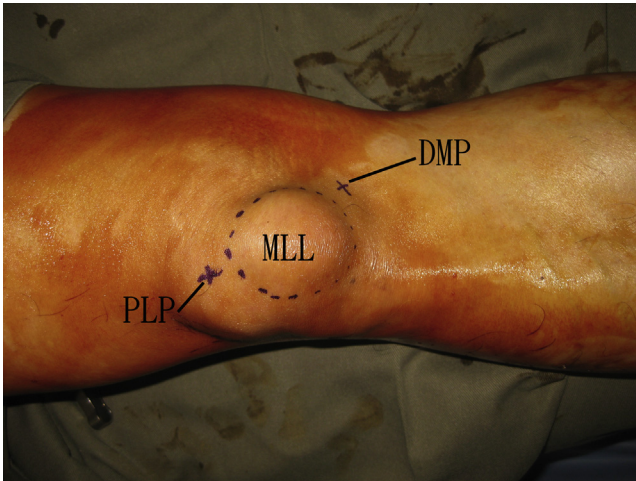


Fig 2. Endoscopic resection of chronic MLL of the right knee. The patient is in supine position with the legs spread. The procedure is performed with the proximal lateral and distal medial portals at the proximal lateral and distal medial ends of the lesion respectively. (DMP, distal medial portal; MLL, Morel–Lavallée lesion; PLP, proximal lateral portal.)

in cases of late diagnosis and imaging, imaging studies might mislead and be interpreted as soft-tissue mass or neoplasm.⁹

The patient is in supine position with the legs spread. An ipsilateral thigh tourniquet is used to provide a bloodless surgical field. Fluid inflow is driven by gravity, an arthropump is not used, and a 4.0-mm, 30° arthroscope (DYONICS; Smith & Nephew, Andover, MA) is used.

Portal Placement

The procedure is performed with the proximal lateral and distal medial portals at the proximal lateral and distal medial ends of the lesion respectively (Fig 2). The

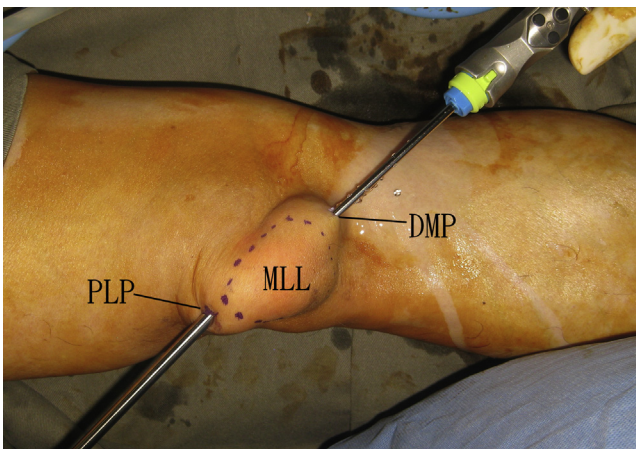


Fig 3. Endoscopic resection of chronic MLL of the right knee. The patient is in supine position with the legs spread. The endoscopic procedure is performed via the proximal lateral and distal medial portals. (DMP, distal medial portal; MLL, Morel–Lavallée lesion; PLP, proximal lateral portal.)

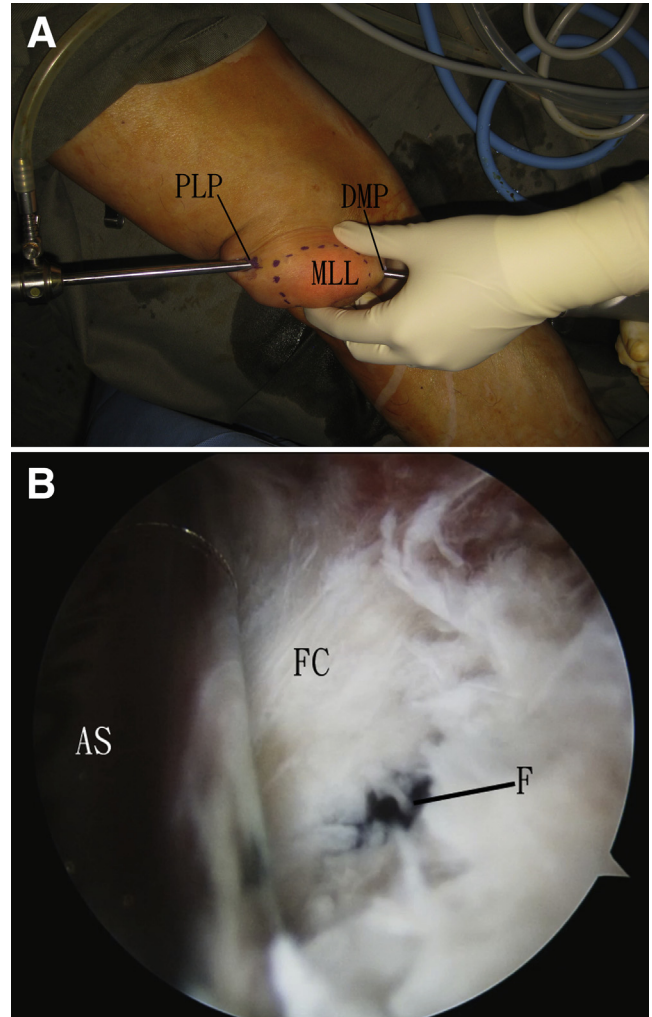


Fig 4. Endoscopic resection of chronic MLL of the right knee. The patient is in supine position with the legs spread. (A) The assistant is holding and stabilizing the mobile lesion when the superficial capsule of the lesion is fenestrated with an arthroscopic shaver. (B) the proximal lateral portal is the viewing portal and the distal medial portal is the working portal. Endoscopic view shows fenestration of the superficial capsule of the lesion. (AS, arthroscopic shaver; DMP, distal medial portal; FC, fibrous capsule of the MLL; F, fenestration of the capsule; MLL, Morel–Lavallée lesion; PLP, proximal lateral portal.)

2 portals are interchangeable as the viewing and working portals.

Fenestration of the Superficial Wall of the Lesion

Five-millimeter skin incisions are made at the portal sites. The subcutaneous tissue is bluntly dissected by a hemostat down to the superficial surface of the lesion. The subcutaneous tissue is freed from the superficial surface of the lesion by the hemostat, and this forms the initial endoscopic working space. The proximal lateral portal is the viewing portal and the distal medial portal is the working portal (Fig 3). The assistant is holding and

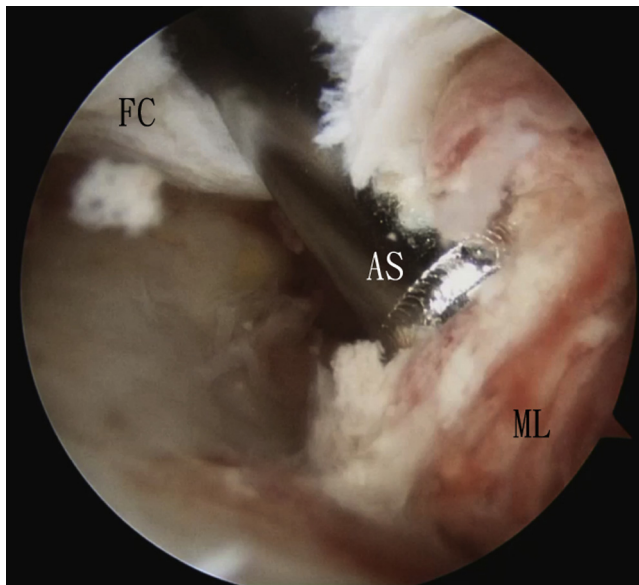


Fig 5. Endoscopic resection of chronic Morel–Lavallée lesion of the right knee. The patient is in supine position with the legs spread. The proximal lateral portal is the viewing portal and the distal medial portal is the working portal. The membranous lining of the lesion is resected with an arthroscopic shaver. (AS, arthroscopic shaver; FC, fibrous capsule of the Morel–Lavallée Lesion; ML, membranous lining of the Morel–Lavallée lesion.)

stabilizing the mobile lesion when the superficial capsule of the lesion is fenestrated with an arthroscopic shaver (DYONICS; Smith & Nephew) (Fig 4). The fenestration is enlarged with an arthroscopic punch forceps (Arthrex, Naples, FL) and Kerrison rougeur (Aesculap, Center Valley, PA) to expose the inner content of the lesion.

Biopsy and Resection of Membranous Lining

The proximal lateral portal is the viewing portal and the distal medial portal is the working portal. The membranous lining of the lesion is biopsied with an arthroscopic punch forceps and the remaining lining is resected with an arthroscopic shaver (Fig 5).

Resection of the Capsule

The proximal lateral portal is the viewing portal and the distal medial portal is the working portal. The thick fibrotic capsule is resected in piecemeal by the arthroscopic punch forceps (Fig 6, Video 1, Table 2).

Compression dressing is applied for 2 weeks to facilitate seal off of the cavity. The patient can start free mobilization of the knee after the compression dressing is taken off. Full weight bearing is allowed immediately after the operation.

Discussion

MLLs are considered chronic lesion when the lesion contains a capsule.⁸ The encapsulated cyst contains a hemosiderin-laden membranous lining and other chronic

blood products.¹¹ The capsule prevents resorption of the fluid content and the lesion will recur when using conservative treatment alone. Treatment methods that best prevent recurrence aim not only to enhance fluid drainage, but also to seal off or completely remove the traumatically created cavity. To this end, surgical debridement with resection of the pseudocapsule is a more definitive treatment option.^{5,12} We believe that endoscopic approach is better than open approach in prevention of post-operative wound complication. However, endoscopic approach still has the risk of inadequate debridement to prevent recurrence and risk of spreading of the bacteria to the surrounding tissue.^{13,14}

Theoretically, portals can be made along the circumference of the lesion. The portals used in this technique are coaxial that can allow freedom of instrumentation and avoid blind spots during endoscopy. The portals are made away from the axis of the thigh and leg to avoid hindrance of motion of the instruments by the thigh and legs.

We consider septic MLL as a relative contraindication of the endoscopic resection. If one wants to perform endoscopic resection of an infected MLL, precautions should be taken to prevent spreading of bacteria, such as avoidance of use of arthro-pump, adequate antibiotic cover and insertion of suction drain.

This minimally invasive technique has the advantage of less soft-tissue trauma, better cosmetic results, less wound complications, and less risk of nerve injury. The potential

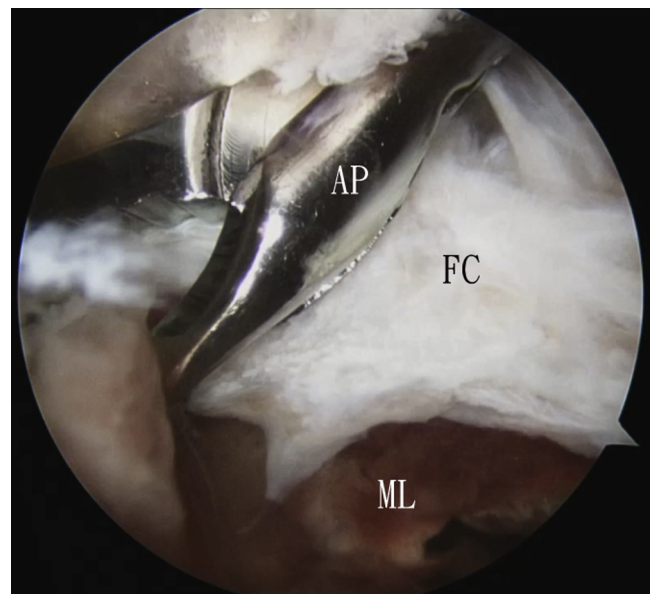


Fig 6. Endoscopic resection of chronic Morel–Lavallée lesion of the right knee. The patient is in supine position with the legs spread. The proximal lateral portal is the viewing portal and the distal medial portal is the working portal. The thick fibrotic capsule is resected in piecemeal by an arthroscopic punch forceps. (AP, arthroscopic punch; FC, fibrous capsule of the Morel–Lavallée Lesion; ML, membranous lining of the Morel–Lavallée lesion.)

Table 2. Pearls and Pitfalls of Endoscopic Resection of Chronic Morel–Lavallée Lesion of the Knee

Pearls	Pitfalls
The knee is extended to facilitate resection of the lesion.	Fluid extravasation may lead to spreading of bacteria in case of infected lesion.
To minimize extravasation, fluid inflow is by gravity and no arthro-pump is used.	Aggressive debridement superficial to the lesion may disrupt the dermal and subcutaneous vascular plexus leading to skin necrosis.
The assistant holds and stabilizes the lesion during fenestration of the superficial capsule of the lesion by the arthroscopic shaver.	

Table 3. Advantages and risks of Endoscopic Resection of Chronic Morel–Lavallée Lesion of the Knee

Advantages	Risks
Less soft-tissue trauma	Recurrence of the lesion
Better cosmetic results	Nerve injury
Fewer wound complications	Skin necrosis
Less risk of nerve injury	Hematoma collection
	Spreading of infection
	Delayed patella tendon rupture

risks of this technique include recurrence of the lesion, nerve injury, skin necrosis, hematoma collection, spreading of infection and delayed patella tendon rupture (Table 3).¹⁵ This is not technically demanding and can be attempted by averaged knee arthroscopists.

References

1. Turner CJ, Van Lancker H. A prepatellar Morel–Lavallée lesion in a pedestrian vs automobile collision. *Am J Emerg Med* 2014;32:109.e3-109.e4.
2. EL Kininy W, Davy S, Sayana M. Unusual Morel–Lavallée lesion of the knee region in an elderly patient. *BMJ Case Rep* 2017;2017, bcr2016218577.
3. Garner A, Beard D, Ostlere S, Price A, Rout R. Morel–Lavallée lesions of the knee: A closed degloving injury: A report of two cases. *ANZ J Surg* 2014;84:789-791.
4. Bonilla-Yoon I, Masih S, Patel DB, et al. The Morel-Lavallée lesion: pathophysiology, clinical presentation, imaging features, and treatment options. *Emerg Radiol* 2014;21:35-43.
5. Vassalou EE, Zibis AH, Raoulis VA, Tsifountoudis IP, Karantanias AH. Morel–Lavallée lesions of the knee: MRI findings compared with cadaveric study findings. *AJR Am J Roentgenol* 2018;210:W234-W239.
6. Vanhegan IS, Dala-Ali B, Verhelst L, Mallucci P, Haddad FS. The Morel–Lavallée lesion as a rare differential diagnosis for recalcitrant bursitis of the knee: case report and literature review. *Case Rep Orthop* 2012;2012:593193.
7. Tejwani SG, Cohen SB, Bradley JP. Management of Morel–Lavallée lesion of the knee: Twenty-seven cases in the national football league. *Am J Sports Med* 2007;35:1162-1167.
8. Pikkell YY, Hasan MJ, Ben-Yehuda Raz D, Naftali YB, Duek OS, Ullman Y. Morel–Lavallée lesion—A case report and review of literature. *Int J Surg Case Rep* 2020;76:103-106.
9. Kumar S, Hasan R, Kadavigere R, Maddukur SB, Puppala R. Morel–Lavallée lesion (MLL) mimicking a soft tissue neoplasm. *J Clin Diagn Res* 2015;9:TD01-TD02.
10. Scolaro JA, Chao T, Zamorano DP. The Morel–Lavallée lesion: Diagnosis and management. *J Am Acad Orthop Surg* 2016;24:667-672.
11. McLean K, Popovic S. Morel–Lavallée lesion. *RadioGraphics* 2017;37:190-196.
12. Kontis E, Vezakis A, Psychogiou V, Kalogeropoulos P, Polydorou A, Fragulidis G. Morel–Lavallée lesion: Report of a case of unknown mechanism. *Case Rep Surg* 2015;205:947450.
13. Meade TC, Briones MS, Fosnaugh AW, Daily JM. Surgical outcomes in endoscopic versus open bursectomy of the septic prepatellar or olecranon bursa. *Orthopedics* 2019;42:e381-e384.
14. Schlesinger NH, Friis-Moller A, Hvolris J. Necrotizing fasciitis after arthroscopic synovectomy of an infected prepatellar bursa. *Ugeskr Laeger* 2007;169:1693-1695.
15. Epstein DM, Capeci CM, Rokito AS. Patella tendon rupture after arthroscopic resection of the prepatellar bursa—a case report. *Bull NYU Hosp Joint Dis* 2010;68:307-310.