Primary Angle-Closure Disease

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Financial Disclosures

- No financial disclosures
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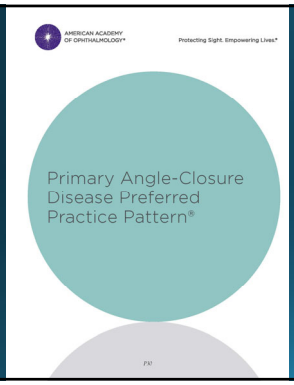
- Clinic Director of the Cedar Springs Eye Clinic



2020 AAO Preferred Practice Pattern

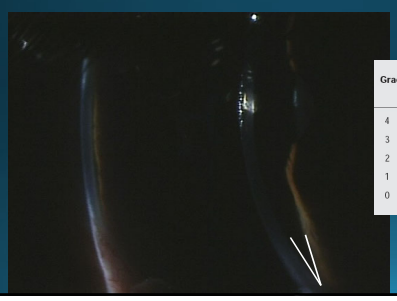
Spectrum of Disease

- Primary Angle-Closure Suspect (PACS)
- Primary Angle-Closure (PAC)
- Acute Angle-Closure Crisis (AACC)
- Primary Angle-Closure Glaucoma (PACG)
- Plateau Iris Configuration and Syndrome

PAC Disease Management

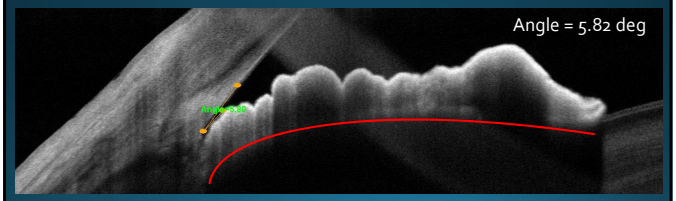
- Reverse/prevent angle closure to control IOP and prevent glaucomatous optic nerve damage
- Could be misdiagnosed as POAG
- Utilize anterior segment OCT and/or ultrasound biomicroscopy
- Need to perform dark-room compression gonioscopy before & after treatment

Evaluation

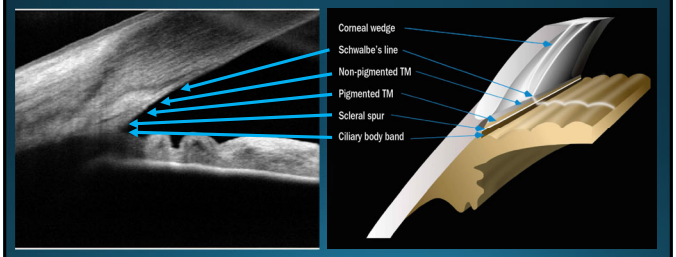


Grade	Interpretation
4	Angle closure very unlikely; Chamber angle approx. 35°… 45°
3	Angle closure unlikely; Chamber angle approx. 20°… 35°
2	Angle closure possible; Chamber angle approx. 20°|
1	Angle closure likely; Chamber angle approx. 10°
0	Angle closure; Chamber angle approx. 0°

Anterior Segment OCT

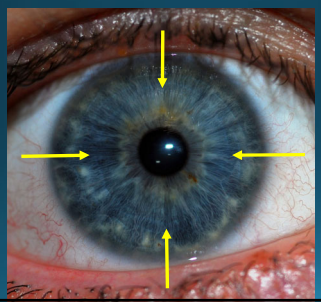


Anterior Segment OCT

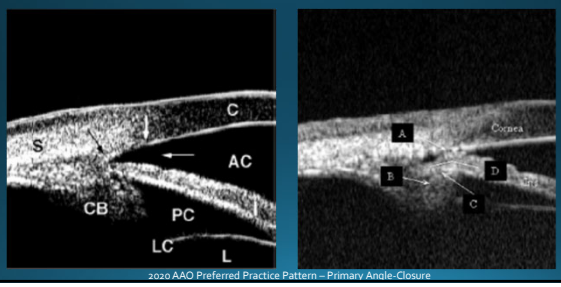


Philippin H, Peter Shah P, Burton, M. The next step: detailed assessment of an adult glaucoma patient. Comm Eye Health Vol. 25 No. 79 & 80 2012 pp 50-53.

Scan Location

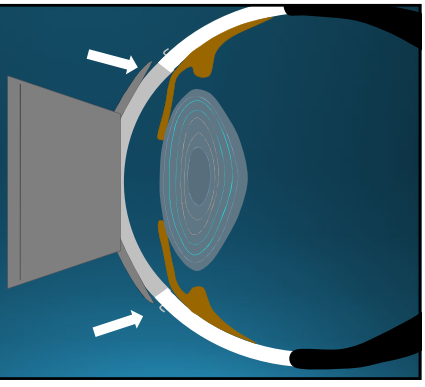


Ultrasound Biomicroscopy

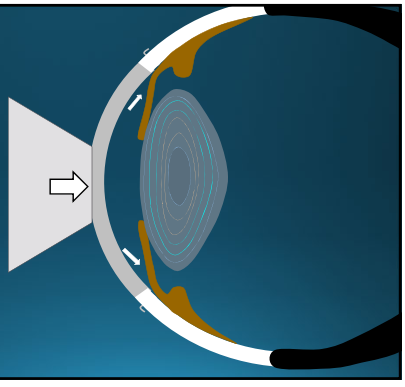


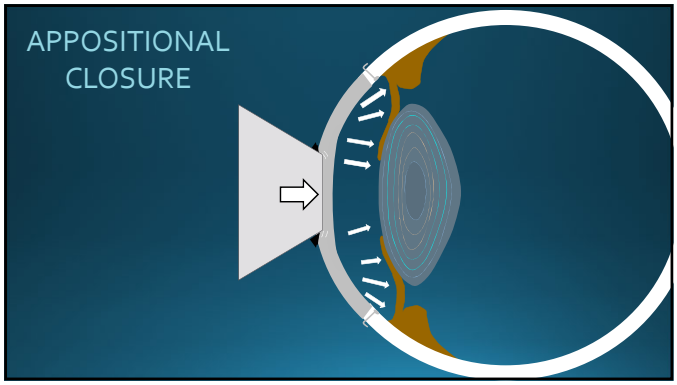
2020 AAO Preferred Practice Pattern – Primary Angle-Closure

NARROW ANGLE

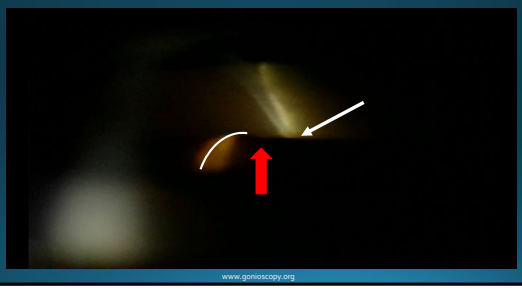


NARROW ANGLE

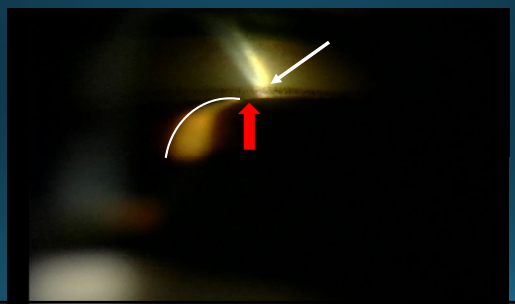




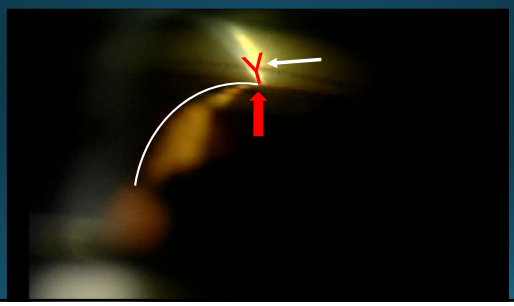
Appositional Closure



Appositional Closure



Appositional Closure



Spectrum of Disease

- Primary Angle-Closure Suspect (PACS)
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- Acute Angle-Closure Crisis (AACC)
- Primary Angle-Closure Glaucoma (PACG)

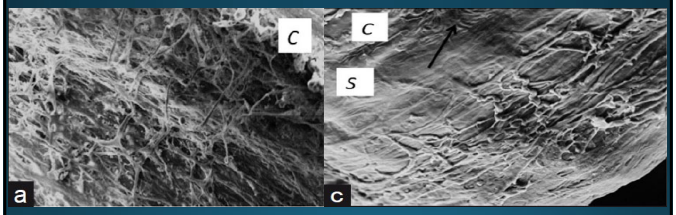
Primary Angle-Closure Suspect (PACS)

- At least 180 degrees of iridotrabecular contact (ITC)
- Normal IOP
- No peripheral anterior syncheie (PAS)
- No optic neuropathy
- Amount of ITC is debated (Dark Room Gonioscopy)

Primary Angle-Closure (PAC)

- At least 180 degrees of iridotrabecular contact (ITC)
- Elevated IOP or PAS
- No optic neuropathy
- Rarely results in Acute Angle-Closure Crisis
- Majority asymptomatic!!!!

Scanning Electron Micrograph of TM



Chronic or repeated ITC can damage the TM and cause PAS

Sihota. Indian Journal of Ophthalmology 2012; 60:183-8

Acute Angle-Closure Crisis (AACC)

- Occluded angle with symptomatically high IOPs
- PAC is bilateral, 90% AACC will oc… …lly
- 48% will dev…
- If left … …have AACC in the fellow eye

Discussed Later

Aung T, Friedman DS, Chew PT, et al. Long-term outcomes in Asians after acute primary angle closure. Ophthalmology 2004;111:1464-9.

Primary Angle-Closure Glaucoma (PACG)

- PAC with optic neuropathy or damage as a result of AACC
- Estimated over 17 million worldwide (72% from Asia)
- In China alone:
  - Unilateral blindness in 5.2 million people
  - Bilateral blindness in another 1.7 million people

Foster PJ, Johnson GJ. Glaucoma in China: how big is the problem? Br J Ophthalmol 2001;85:1277-82.
Zhang N, Wang J, Chen B, Li Y, Jiang B. Prevalence of Primary Angle Closure Glaucoma in the Last 20 Years: A Meta-Analysis and Systematic Review. Front Med (Lausanne). 2021 Jan 18;7:624179.

Definition Review

TABLE 1 Clinical Findings That Define Patients Seen with Angle-Closure Disease

	Primary Angle-Closure Suspect	Primary Angle Closure	Primary Angle-Closure Glaucoma
≥180 degrees ITC	Present	Present	Present
Elevated IOP or PAS	Absent	Present	Present
Optic nerve damage	Absent	Absent	Present

IOP = intraocular pressure; ITC = iridotrabecular contact; PAS = peripheral anterior synechiae

2020 AAO Preferred Practice Pattern – Primary Angle-Closure Disease

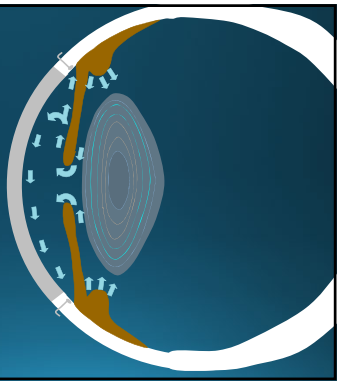
Risk Factors

- Inuit, Chinese and other Asian populations
- Hyperopia
- Females have a 4:1 risk compared to males
- Incidence increases proportionately with age (>50yo)
- Short axial length & thick, anteriorly positioned lens
  - Family history of angle closure

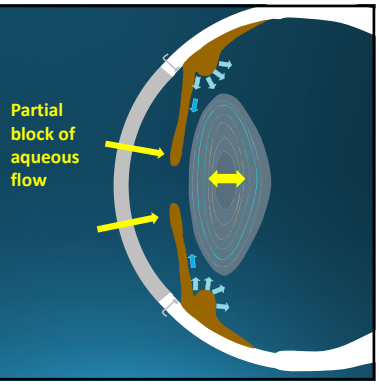
Mechanism – Pupillary Block

- Iris-lens contact blocks aqueous flow through pupil
- Increases posterior chamber pressure
- Bows peripheral iris forward (Iris Bombe)
- Partially blocks aqueous outflow through the TM
- Elevates IOP
- Potential glaucomatous damage

Normal Aqueous Outflow

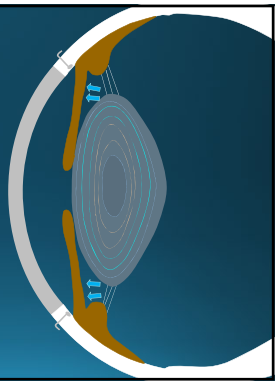


Primary Angle-Closure

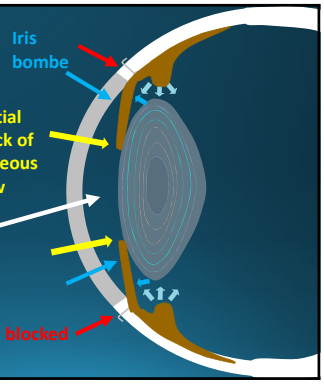


Primary Angle-Closure

Increased Posterior Chamber Pressure
=
Pushes Iris Forward
(Iris Bombe)



Primary Angle-Closure



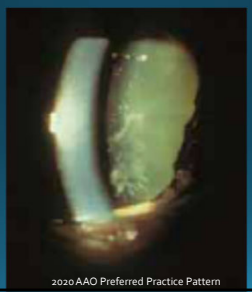
Majority asymptomatic!!!!

Sub-Acute/Intermittent AACC

Symptoms	Signs
• Blurred vision	• Narrow angle
• Seeing halos around lights	• At least 180 degrees of ITC
• Headache	• Elevated IOP
• Eye pain	

Symptoms after moments of stress, dilation or medication use

Glaucomflecken via SLE



2020 AAO Preferred Practice Pattern

PAC Suspect Management

- Monitor for conversion to PAC via elevated IOP, PAS
  - Baseline data and annual monitoring
- Patient education – Importance of follow-up
- Consider laser peripheral iridotomy (LPI)?

ZAP Trial

- Large population-based randomized clinical trial in China
- Primary angle-closure suspects aged 50 to 70 years
- One eye treated with LPI, other eye untreated as a control
- Monitor for 6 years

Jiang Y, Chang DS, et al. Longitudinal changes of angle configuration in primary angle-closure suspects: the Zhongshan Angle-Closure Prevention Trial. Ophthalmology. 2014 Sep;121(9):1699-1705. doi: 10.1016/j.ophtha.2014.03.039. Epub 2014 May 15.

Trial Results – Treated Group

- Angle opened markedly and remained stable for 6mo
- Angle significantly narrowed at 18mo mark
- 50% reduced risk of developing PAC over 6 years

Jiang Y, Chang DS, et al. Longitudinal changes of angle configuration in primary angle-closure suspects: the Zhongshan Angle-Closure Prevention Trial. Ophthalmology. 2014 Sep;121(9):1699-1705. doi: 10.1016/j.ophtha.2014.03.039. Epub 2014 May 15.

Trial Results – Untreated Group

- Consistent, rapid narrowing angle width
- Only 4% progressed to PAC
- Conclusion: LPI not likely needed

He M, Jiang Y, Huang S, Chang DS, Munoz B, Aung T, Foster PJ, Friedman DS. Laser peripheral iridotomy for the prevention of angle closure: a single-centre, randomised controlled trial. Lancet. 2019 Apr 20;393(10181):1609-1618.

Vellore Eye Survey (VES)

- Large population-based prospective study in South India
- 1932 people screened for PACS, PAC, PACG
- Identified 972 PACS (50%) and 37 PAC (2%)

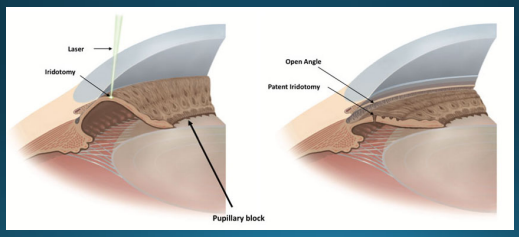
Thomas R, et al. Five year risk of progression of primary angle closure suspects to primary angle closure: a population based study. Br J Ophthalmol. 2003;87(4):450-454.

5 Years after Vellore Eye Survey (VES)

- 50 PACS (5%) patients returned for re-evaluation
  - 11 developed PAC – 22%
  - 0 developed PACG
- Conclusion: Preventative treatment may be indicated

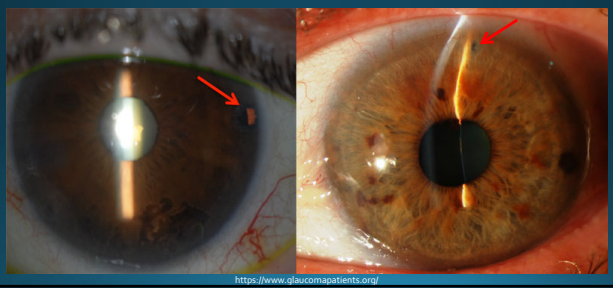
Thomas R, et al. Five year risk of progression of primary angle closure suspects to primary angle closure: a population based study. Br J Ophthalmol. 2003;87(4):450-454.

LPI



https://www.glaucomapatients.org/

LPI



https://www.glaucomapatients.org/

LPI Placement

- 169 PACS and/or PAC patients
- Superior LPI in one eye, temporal in the other
- Results: Temporal placement of LPI was safe and less likely to result in linear dysphotopsia as compared with superior placement.
- Conclusion: Temporal iris therefore may be considered a preferred location for LPI.

Vera V, Naqi A, Belovay GW, Varma DK, Ahmed II. Dysphotopsia after temporal versus superior laser peripheral iridotomy: a prospective randomized paired eye trial. Am J Ophthalmol. 2014 May;157(5):929-35.

Primary Angle-Closure Management

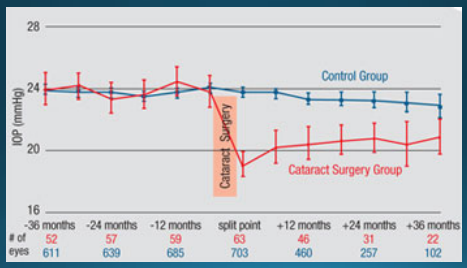
- Elevated IOP may result in permanent outflow resistance
- Closely monitor for glaucoma
- Patient education – AACC & sub-acute/intermittent AAC
- Consider LPI?
- Consider cataract surgery?

5 Years after Vellore Eye Survey (VES)

- 28 PAC (75%) patients returned for re-evaluation
  - 8 developed PACG – 28.5%
  - 0 developed AACC
- Conclusion: Preventative treatment may be indicated

Thomas R, et al. Five-year risk of progression of primary angle closure to primary angle closure glaucoma: a population-based study. Acta Ophthalmol Scand. 2003 Oct;81(5):480-5.

IOP Reduction in Hypertensives s/p Cataract Sx Alone



https://www.reviewofophthalmology.com/article/when-glaucoma-patients-have-cataract-surgery

EAGLE Trial

- Multicenter, randomized clinical trial in the UK
- Patient aged ≥50 years
- Newly diagnosed PAC with IOP ≥30 mm Hg or PACG
- Did not have cataracts

Azuara-Blanco A, Burr J, et al. Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomised controlled trial. Lancet. 2016 Oct 1;388(10052):1389-1397. doi: 10.1016/S0140-6736(16)30956-4.

EAGLE Trial

- Two arms:
  - Clear-lens extraction OU
  - LPI and topical medical treatment
    - Target IOP 15–20 mm Hg

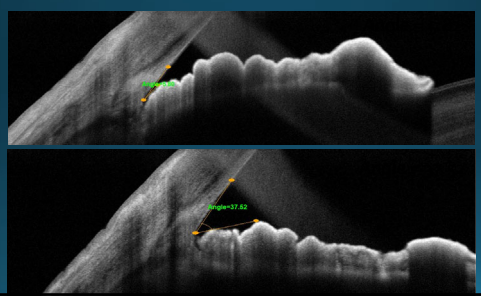
Azuara-Blanco A, Burr J, et al. Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomised controlled trial. Lancet. 2016 Oct 1;388(10052):1389-1397. doi: 10.1016/S0140-6736(16)30956-4.

Trial Results

- Cleans-lens extraction was better at managing IOP and more cost-effective compared to LPI/topical medications
- Conclusions: Cataract surgery for PACG and PAC ≥30mmHg

Azuara-Blanco A, Burr J, et al. Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomised controlled trial. Lancet. 2016 Oct 1;388(10052):1389-1397. doi: 10.1016/S0140-6736(16)30956-4.

Angle S/P Cataract Surgery



Acute Angle-Closure Crisis (AACC)

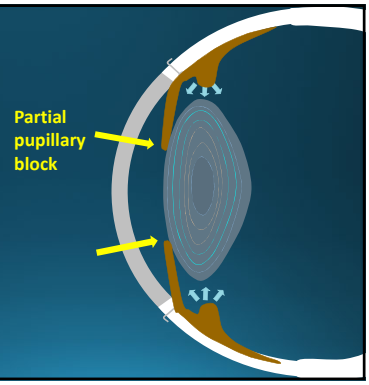
- Occluded angle with symptomatically high IOPs
- PAC is bilateral, 90% AACC will occur unilaterally
- 48% will develop PACG (10% blind)
- If left untreated, 50% will have AACC in the fellow eye

Aung T, Friedman DS, Chew PT, et al. Long-term outcomes in Asians after acute primary angle closure. Ophthalmology 2004;111:1464-9.

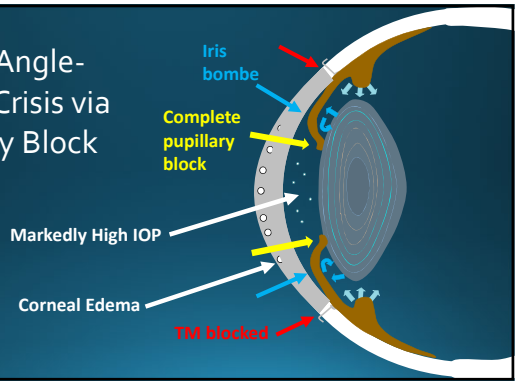
Mechanism – Pupillary Block

- Iris-lens contact blocks aqueous flow through pupil
- Increases posterior chamber pressure
- Bows peripheral iris forward (Iris Bombe)
- Completely blocks aqueous outflow through the TM
- Rapid rise to markedly high, symptomatic IOP

Primary Angle-Closure



Acute Angle-Closure Crisis via Pupillary Block



Symptoms

- Rapid, painful loss of unilateral vision
- Periocular pain
- Nausea
- Vomiting
- Photophobia
- Red eye
- Seeing halos around lights
- Headache

Signs

- Decreased visual acuity and/or visual field
- Ciliary flush
- Corneal edema
- Shallow anterior chamber
- Iris bombe
- Fixed mid-dilated pupil
- Marked elevated IOP
- Anterior chamber reaction

Management

- Step 1: Break the Attack
- Step 2: Refer for laser peripheral iridotomy (LPI)
- Step 3: Evaluate extent of damage
- Step 4: Prevent future damage

Step 1: Break the Attack

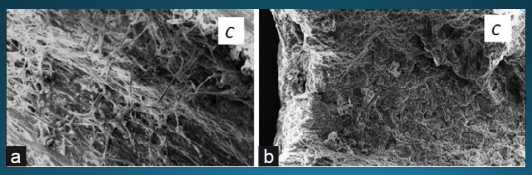
- Topicals:
  - Beta blockers
  - Alphagan
  - CAIs
  - Pilocarpine
- Oral:
  - Diamox – 2x 250mg tablets
- Corneal indentation

Step 2: Refer for LPI

- Call OMD for same day referral
- If next day, 1-2% Pilocarpine (not 4%)
- Call pharmacy to ensure in-stock

Step 3: Evaluate Extent of Damage

- Baseline data
- New "normal" IOP



Sihota. Indian Journal of Ophthalmology 2012; 60:183-8

Step 4: Prevent Future Damage

- Based on Eagle Trial, refer for cataract surgery
- Consider if long-term glaucoma therapy is needed (topical/surgical)

Azuara-Blanco A, Burr J, et al. Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomised controlled trial. Lancet. 2016 Oct 1;388(10052):1389-1397. doi: 10.1016/S0140-6736(16)30956-4.

Questions?

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