

Mucin Production in Prostatic Adenocarcinoma: A Retrospective Study of 190 Radical Prostatectomy and/ or Core Biopsy Specimens in Department of Pathology, Siriraj Hospital, Mahidol University, Thailand

Siroth Noiwan MD*,
Samrerng Rattanaapee MD*

* Department of Pathology, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand

Background: Diagnoses of prostatic adenocarcinoma are made based on a constellation of architectural, cytological, and ancillary findings, which include intraluminal mucin secretion. Several studies have shown that luminal acid mucin is frequently present in prostatic adenocarcinoma. Immunohistochemical stain (immunostaining) becomes extremely helpful in the diagnosis of prostatic adenocarcinoma, especially in doubtful cases. However, presently, the technique is not available in most hospitals, particularly in the regional or provincial areas. Thus, luminal acid mucin and its detection by histochemical stains may be one of the useful tools in diagnosing prostatic adenocarcinoma.

Objective: To determine the percentage of mucin production in prostatic adenocarcinoma from 190 radical prostatectomy and/or core biopsy specimens in the Department of Pathology, Siriraj Hospital, Mahidol University, to compare the percentage of positivity among three different special histochemical stains (mucicarmin, Alcian blue at pH 2.5, and colloidal iron), and to determine the PSA-expression among the prostatic adenocarcinoma that produces mucin by immunohistochemical technique.

Material and Method: The present study is a retrospective study of 190 cases that were diagnosed as prostatic adenocarcinoma (with any Gleason's microscopic pattern) from radical prostatectomy and/or core biopsy specimens in Department of Pathology, Siriraj Hospital, Mahidol University between January 2006 and May 2007. All cases were retrieved from a computer filing system of the Department. All H&E slides that contained diagnostic materials were reviewed and stained with all three different special histochemical stains. Positive cases were subsequently studied to find PSA expression by means of immunohistochemical study. Cases with microscopic variants of prostatic adenocarcinoma and metastasis were excluded.

Results: One hundred and seventy seven cases (93%) of these prostatic adenocarcinomas were positive for at least one of three different special histochemical stains for acid mucin. Among these, 167 cases (88%) were positive for mucicarmin, 157 (83%) cases were positive for Alcian blue at pH 2.5, and 173 cases (91%) were positive for colloidal iron. All 177 cases were positive for PSA immunohistochemical stain.

Conclusion: Intraluminal acid mucin and its detection by special histochemical stains is one of the useful methods (with a high percentage of positivity) in diagnosing prostatic adenocarcinoma in association with other architectural and cytological criteria. Mucicarmin and colloidal iron stains appear to be more useful than Alcian blue at pH 2.5 stain according to their positivity percentage. However, in pathologic practice, mucicarmin stain is more commonly used than colloidal iron stain due to the difficulty in preparation and interpretation of the latter. There is no correlation between mucin production and PSA expression in prostatic adenocarcinoma but PSA immunohistochemical stain is still useful to confirm the prostatic origin of poorly differentiated carcinomas or metastatic lesions.

Keywords: Prostatic adenocarcinoma, Intraluminal acid mucin, Radical prostatectomy, Core biopsy, Mucicarmin histochemical stain, Alcian blue at pH 2.5 histochemical stain, Colloidal iron histochemical stain, PSA immunohistochemical stain

J Med Assoc Thai 2011; 94 (2): 224-30

Full text. e-Journal: <http://www.mat.or.th/journal>

Correspondence to:

Rattanaapee S, Department of Pathology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand,
Phone: 0-2419-7000 ext. 6515
E-mail: sisrt@mahidol.ac.th

Prostate adenocarcinoma is the most common form of cancer among men in the United States and the second leading cause of cancer-related deaths in men⁽¹⁾.

In Thailand, prostatic adenocarcinoma is one of the five most common malignancies in men. The estimated incidence rate of prostate cancer is 4.9 per 100,000. The age-specific incidence rate rapidly rises with age. The trend gradually increased during the past decade⁽²⁾. In Siriraj Hospital, prostate cancer is the second most common malignancy in male⁽³⁾.

In general, the pathological diagnosis of prostatic adenocarcinoma is made based on a constellation of architectural, cytological, and ancillary findings⁽¹⁾.

Intraluminal mucin secretion is one of ancillary features of prostate cancer⁽⁴⁻⁷⁾. It has been demonstrated that approximately two-thirds of prostatic adenocarcinomas produce acid mucin. This appears as luminal amorphous or delicate, threadlike, faintly basophilic (blue-tinged) secretion in H & E stained sections and can be easily confirmed with mucicarmine, Alcian blue and/or colloidal iron stain⁽⁸⁻¹²⁾. Normal prostatic epithelium contains scant neutral mucin that is reactive for Periodic acid Schiff stain⁽¹³⁾.

Recently, several studies have shown that luminal acid mucin is frequently present in prostatic adenocarcinoma and can be helpful in the diagnosis^(14,15). It is also clear that the presence of acid mucin is not restricted to prostatic adenocarcinoma but can also occur in atrophy, basal cell hyperplasia, adenosis, sclerosing adenosis, prostatic intraepithelial neoplasia (PIN), and nodular hyperplasia⁽¹⁶⁻¹⁹⁾. However, one report considers intraluminal mucin secretion to be a very useful criterion for the diagnosis of prostate cancer in needle biopsies since it is specific (100%) and relatively sensitive (52%) when benign small gland proliferations, such as adenosis and sclerosing adenosis, have been ruled out⁽¹⁵⁾.

In Thailand, especially in Siriraj Hospital, the study of mucin production in prostatic adenocarcinoma has not yet been established. Although immunohistochemical study has become extremely useful in the diagnosis, the technique is not available in regional or provincial hospitals in Thailand. Diagnosis of malignant acini is traditionally based on the absence of basal cells that possess specific markers. The most commonly used antibody is clone 34βE12, which is antibody to high-molecular-weight cytokeratin⁽²⁰⁾. Prostate-specific antigen expression is also helpful in diagnosing difficult cases of prostatic carcinoma. Thus, luminal acid mucin and its detection

by special histochemical stains may be one of the useful criteria in diagnosing prostatic adenocarcinoma.

Prostate-specific antigen (PSA) is one of the very few tumor type-specific immunohistochemical markers. It is currently available and widely used to establish the prostatic origin of poorly differentiated carcinoma. It has been shown that poorly differentiated prostatic cancer frequently expresses significantly less PSA than benign prostatic tissue or low-grade prostatic cancer^(20,21).

Material and Method

This retrospective study includes 190 cases that were diagnosed as prostatic adenocarcinoma from radical prostatectomy and/or core biopsy specimens in the Department of Pathology, Siriraj Hospital, Mahidol University between January 2006 and May 2007. The cases were retrieved from a computer filing system of the Department by strict criteria.

Inclusion criteria (cases)

One hundred and ninety cases diagnosed as prostatic adenocarcinoma from radical prostatectomy and/or core biopsy specimens with any of Gleason's microscopic pattern with adequate material for study.

Exclusion criteria (cases)

Other microscopic variants of prostatic adenocarcinoma: mucinous adenocarcinoma, signetring cell adenocarcinoma, adenocarcinoma with neuroendocrine feature, adenosquamous carcinoma, squamous cell carcinoma, adenoid basal cell tumor, basaloid carcinoma, lymphoepithelioma-like carcinoma, tubulocystic clear cell adenocarcinoma and sarcomatoid carcinoma.

Metastatic tumor of prostate gland.

Inadequate material for study.

Sample size

Since the objective of the present study was to estimate the proportion of mucin production in prostatic adenocarcinoma, sample size estimation was based on 95% confidence interval (CI) of the true (population) proportion of mucin production in prostatic adenocarcinoma by using the following formula:

$$n = Z_{1-\alpha}^2 pq/d^2$$

Where p = expected proportion of mucin production in population = 0.67

$$q = 1 - p = 0.33$$

$$d = \text{allowable error} = 10\%p = (0.1)(0.67) = 0.067$$

α = probability of type I error or level of significance = 0.05 (2-sided)

$Z_{1-\alpha}$ = Z at level $1-\alpha$ = Z at level of confidence = 1.96

$$\text{Thus, } n = \frac{1.96^2 (0.67) (0.33)}{0.067^2}$$

$n = 190$

Study procedure

Review H&E slides of all cases that contain diagnostic materials for prostatic adenocarcinoma and stain with three different special histochemical stains (mucicarmine, Alcian blue at pH 2.5 and colloidal iron) to detect acid mucin production.

Cases with acid mucin production (positive for any of three of special histochemical stains) will be subsequently immunohistochemical stained for PSA. The results were expressed as number of cases and percentage of total.

Results

One hundred and seventy seven cases (93%) of these prostatic adenocarcinomas were positive for at least one of three different special histochemical stains for acid mucin whereas 13 cases were negative for all three different special histochemical stains for acid mucin (Table 1).

Among these acid mucin productions, 167 cases (88%) were positive for mucicarmine, 157 cases (83%) were positive for Alcian blue at pH 2.5, and 173 cases (91%) were positive for colloidal iron.

All 177 cases of positive acid mucin production expressed PSA.

Discussion

Among three different special histochemical stains used in the study, Alcian blue at pH 2.5 stain appears to be less useful than other two stains according to their positive results. Generally, it is used to confirm acid mucin production in various tumors including epithelial and soft tissue tumors according

Table 1. Numbers of cases with positive mucicarmine, Alcian blue at pH 2.5, and colloidal iron stains

Stains	Overall positive results
Mucicarmine	167/190 (88%)
Alcian blue at pH 2.5	157/190 (83%)
Colloidal iron	173/190 (91%)
PSA	177/177 (100%)

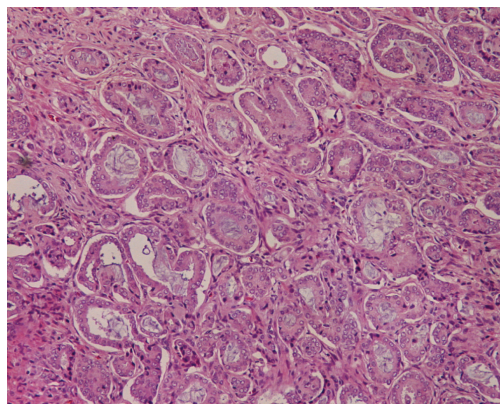


Fig. 1 Prostatic adenocarcinoma, radical prostatectomy specimen (H & Ex 100), intraluminal acid mucin production appearing as amorphous or delicate, threadlike, faintly basophilic (blue-tinged) secretion

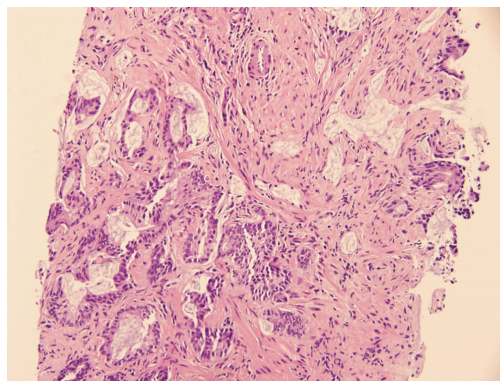


Fig. 2 Prostatic adenocarcinoma, core biopsy specimen (H & Ex 200), intraluminal acid mucin production appearing as amorphous or delicate, threadlike, faintly basophilic (blue-tinged) secretion

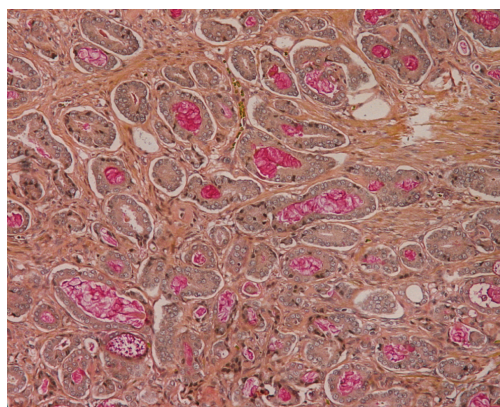


Fig. 3 Prostatic adenocarcinoma, radical prostatectomy specimen (Mucicarmine 100), positive for mucicarmine stain appearing as red-colored

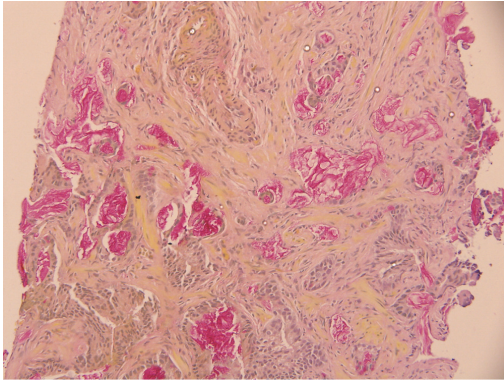


Fig. 4 Prostatic adenocarcinoma, core biopsy specimen (Mucicarminex 200), positive for mucicarmine stain appearing as red-colored

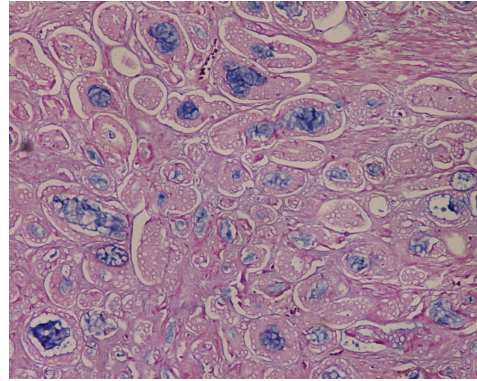


Fig. 5 Prostatic adenocarcinoma, radical prostatectomy specimen (Alcian blue at pH 2.5 x 100), positive for Alcian blue at pH 2.5 stain appearing as blue-colored

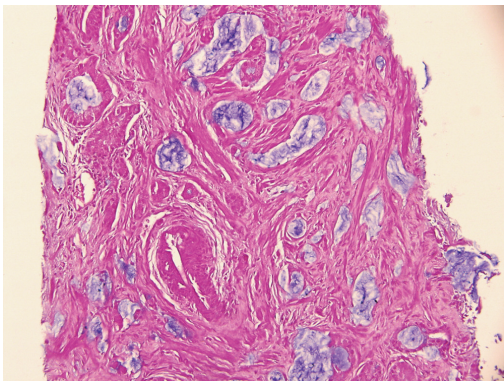


Fig. 6 Prostatic adenocarcinoma, core biopsy specimen (Alcian blue pH 2.5 x 200), positive for Alcian blue at pH 2.5 stain appearing as blue-colored

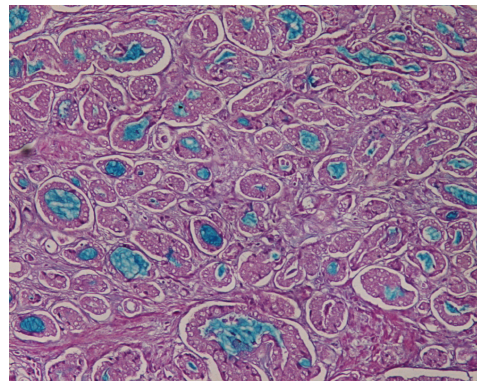


Fig. 7 Prostatic adenocarcinoma, radical prostatectomy specimen (Colloidal iron x100), positive for colloidal iron stain appearing as blue-colored

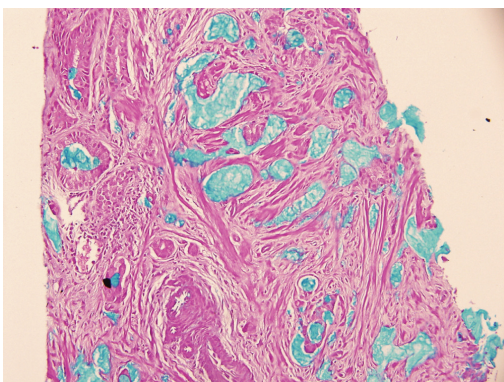


Fig. 8 Prostatic adenocarcinoma, core biopsy specimen (Colloidal iron x200), positive for colloidal iron stain appearing as blue-colored

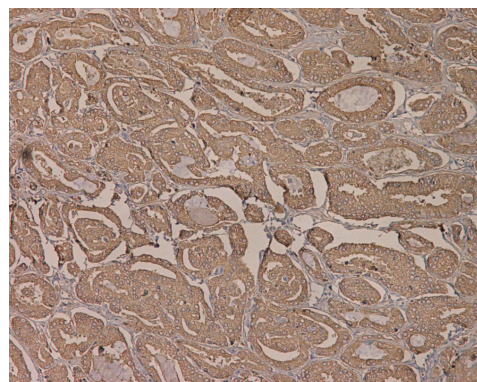


Fig. 9 Prostatic adenocarcinoma, radical prostatectomy specimen (PSA x100), positive for PSA immunostaining appearing as intracytoplasmic brown-colored

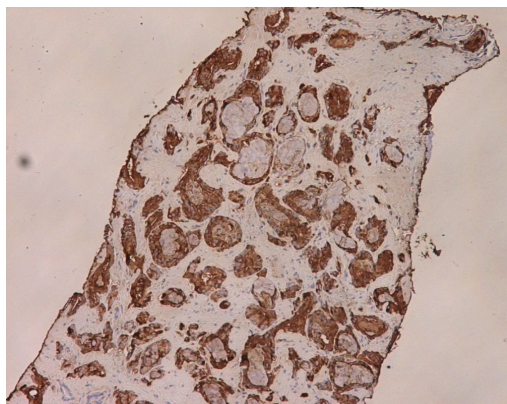


Fig. 10 Prostatic adenocarcinoma, core biopsy specimen (PSA x100), positive for PSA immunostaining appearing as intracytoplasmic brown-colored

to their pH. Thus, it is not quite specific for acid mucin production in prostatic adenocarcinoma. In addition, it has a highly stainable background that makes it difficult to interpret. Colloidal iron stain is not widely used because it is difficult to prepare. It also has a highly stainable background that makes it difficult to interpret as well. The authors prefer mucicarmine stain to confirm acid mucin production in prostatic adenocarcinoma since it is widely used to detect acid mucin production in various epithelial tumors and is easy to prepare and interpret.

In the present study, limitations of positive results for mucin production and detection are because of the few malignant acini in many cases of core biopsy. Some cases may show malignant acini in only one core. Some areas of malignant prostatic acini are cut through during additional cutting. Furthermore, some radical prostatectomy specimens contain malignant prostatic acini in only one slide as well. Thus, actual mucin production in prostatic adenocarcinoma may be more common.

Before the present study, the authors expected that prostatic adenocarcinoma with mucin production might express less PSA than those without mucin production might express less PSA than those without mucin production. It was found that all of these mucin producing prostatic adenocarcinomas also express PSA. Thus, mucin production in prostatic adenocarcinoma shows no relation with PSA expression. Nevertheless, PSA immunohistochemical stain is still useful to establish the prostatic origin of poorly differentiated carcinoma of metastatic cancer.

Conclusion

Intraluminal acid mucin and its detection by special histochemical stains is one of the useful methods (with high percentage of positivity) in diagnosing prostatic adenocarcinoma in association with other architectural and cytological criteria. It appears as luminal amorphous or delicate, threadlike, faintly basophilic (blue-tinged) secretion in the routinely H & E stained sections and can be easily confirmed with special histochemical stains. Mucicarmine and colloidal iron stains appear to be more useful than Alcian blue at pH 2.5 stain according to their positivity percentage. However, in pathologic practice, mucicarmine stain is more commonly used than colloid iron stain due to the difficulty in preparation and interpretation of the latter stain even though it seems to be more sensitive and specific for acid mucin production in prostatic adenocarcinoma and expresses PSA. There is no correlation between mucin production and PSA expression in prostatic adenocarcinoma. However, PSA immunohistochemical stain is still useful to establish the prostatic origin of poorly differentiated carcinoma.

Acknowledgements

The authors wish to thank Mr. Swat Thapichaamporn, Ms. Rattanawan Srinun, Mrs. Jomkwan Atthaphot, Ms. Kanitthar Srisook, and Mr. Vicha Sookpadthee

Potential conflicts of interest

The research for funded the present study was by the Siriraj Grant for Research Development, Faculty of Medicine Siriraj Hospital, Mahidol University.

References

1. Kumar V, Abbas AK, Fausto N, Robbins SL, Cotran RS. Robbins & Cotran pathologic basis of disease. 7th ed. Philadelphia: Elsevier Saunders; 2005: 1050.
2. Sriplung H, Sontipong S, Martin N, Wiangnon S, Vootiprux V, Cheirsilpa A, et al. Cancer in Thailand Vol.III, 1995-1997. Bangkok: Bangkok Medical Publisher; 2003.
3. Sangruchi S. Annual report of tumor registry in Siriraj Cancer Center. Bangkok: Siriraj Hospital; 2005:27.
4. Che M, Grignon D. Pathology of prostate cancer. Cancer Metastasis Rev 2002; 21: 381-95.
5. Taylor NS. Histochemistry in the diagnosis of early prostatic carcinoma. Hum Pathol 1979; 10: 513-20.

6. Ro JY, Grignon DJ, Troncoso P, Ayala AG. Mucin in prostatic adenocarcinoma. *Semin Diagn Pathol* 1988; 5: 273-83.
7. Pinder SE, McMahon RF. Mucins in prostatic carcinoma. *Histopathology* 1990; 16: 43-6.
8. Rosai J. Rosai and Ackerman's surgical pathology. 9th ed. Philadelphia: Elsevier Mosby; 2004: 1373.
9. Epstein JI, Yang XJ. Prostate biopsy interpretation. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2002: 70.
10. Bostwick DG, Dundore PA. Biopsy pathology of the prostate. London: Chapman & Hall; 1997: 115.
11. Franks LM, O'shea JD, Thomson AE. Mucin in the prostate: a histochemical study in normal glands, latent, clinical and colloid cancers. *Cancer* 1964; 17: 983-91.
12. Hukill PB, Vidone RA. Histochemistry of mucus and other polysaccharides in tumors. II. Carcinoma of the prostate. *Lab Invest* 1967; 16: 395-406.
13. Montironi R, Vela-Navarrete R, Lopez-Beltran A, Mazzucchelli R, Bono A. 2005 update on pathology of prostate biopsies with cancer. *Eur Urol* 2006; 49: 441-7.
14. Epstein JI. Diagnostic criteria of limited adenocarcinoma of the prostate on needle biopsy. *Hum Pathol* 1995; 26: 223-9.
15. Varma M, Lee MW, Tamboli P, Zarbo RJ, Jimenez RE, Salles PG, et al. Morphologic criteria for the diagnosis of prostatic adenocarcinoma in needle biopsy specimens. A study of 250 consecutive cases in a routine surgical pathology practice. *Arch Pathol Lab Med* 2002; 126: 554-61.
16. Grignon DJ, Ro JY, Srigley JR, Troncoso P, Raymond AK, Ayala AG. Sclerosing adenosis of the prostate gland. A lesion showing myoepithelial differentiation. *Am J Surg Pathol* 1992; 16: 383-91.
17. Grignon DJ, O'Malley FP. Mucinous metaplasia in the prostate gland. *Am J Surg Pathol* 1993; 17: 287-90.
18. Goldstein NS, Qian J, Bostwick DG. Mucin expression in atypical adenomatous hyperplasia of the prostate. *Hum Pathol* 1995; 26: 887-91.
19. Epstein JI, Fynheer J. Acidic mucin in the prostate: can it differentiate adenosis from adenocarcinoma? *Hum Pathol* 1992; 23: 1321-5.
20. Varma M, Jasani B. Diagnostic utility of immunohistochemistry in morphologically difficult prostate cancer: review of current literature. *Histopathology* 2005; 47: 1-16.
21. Goldstein NS. Immunophenotypic characterization of 225 prostate adenocarcinomas with intermediate or high Gleason scores. *Am J Clin Pathol* 2002; 117: 471-7.

การสร้างมิวซินในมะเร็งต่อมลูกหมาก: การศึกษาย้อนหลังโดยใช้ชิ้นเนื้อจากการผ่าตัดรักษามะเร็งต่อมลูกหมาก และ/หรือ จากการใช้เข็มเจาะส่งตรวจจำนวน 190 ราย ในภาควิชาพยาธิวิทยา โรงพยาบาลศิริราช มหาวิทยาลัยมหิดล

ศิริธร น้อยวัน, สำเริง รัตนระพี

ภูมิหลัง: การวินิจฉัยมะเร็งต่อมลูกหมากทางพยาธิวิทยากระทำโดยใช้พื้นฐานของลักษณะการจัดเรียงตัว, ลักษณะของเซลล์ และลักษณะอื่น ๆ เช่น การสร้างและหลั่งมิวซินในลูเมนซึ่งช่วยในการวินิจฉัยประกอบกัน ปัจจุบัน มีหลายการศึกษาที่พบว่า มิวซินกรดในลูเมนพบได้บ่อยในมะเร็งต่อมลูกหมากโดยเฉพาะ ในรายที่มีความยากในการวินิจฉัย แต่ในประเทศไทยการย้อมมิวซินในฮิสโตเคมียังไม่สามารถ กระทำได้ในทุกโรงพยาบาลโดยเฉพาะในระดับโรงพยาบาลศูนย์ หรือ โรงพยาบาลจังหวัด ดังนั้นการสร้างมิวซินกรดในลูเมนซึ่งสามารถตรวจพบด้วยการย้อมพิเศษทางฮิสโตเคมีอาจช่วยในการวินิจฉัยมะเร็งต่อมลูกหมากได้

วัตถุประสงค์: เพื่อศึกษาความถี่ และร้อยละของการสร้างมิวซินในมะเร็งต่อมลูกหมากโดยใช้ชิ้นเนื้อที่ได้จากการผ่าตัดรักษามะเร็งต่อมลูกหมากทั้งต่อมและ/หรือจากการใช้เข็มเจาะส่งตรวจจำนวน 190 ราย ในภาควิชาพยาธิวิทยา โรงพยาบาลศิริราช มหาวิทยาลัยมหิดล ศึกษาเปรียบเทียบความถี่และร้อยละของการย้อมติดมิวซินกรดใน มะเร็งต่อมลูกหมาก โดยใช้การย้อมพิเศษทางฮิสโตเคมีที่แตกต่างกัน 3 ชนิด (mucicarmine, Alcian blue ที่ pH 2.5 และ colloidal iron stains) และการศึกษาการย้อมติดพีเอสเอ (PSA-immunostaining) ในมะเร็งต่อมลูกหมากที่พบว่ามีการสร้างมิวซิน

วัสดุและวิธีทำ: เป็นการศึกษาเชิงพรรณนาแบบย้อนหลังโดยใช้ชิ้นเนื้อที่ได้รับการวินิจฉัยเป็นมะเร็งต่อมลูกหมาก จากการผ่าตัดรักษามะเร็งต่อมลูกหมาก และ/หรือ จากการใช้เข็มเจาะส่งตรวจ จำนวน 190 รายในระหว่าง เดือนมกราคม พ.ศ. 2549 ถึงเดือนพฤษภาคม พ.ศ. 2550 ในภาควิชาพยาธิวิทยา โรงพยาบาลศิริราช มหาวิทยาลัยมหิดล โดยมีรูปแบบความรุนแรงทางจุลทรรศน์ (Gleason's microscopic patterns) ในระดับใดก็ได้ ชิ้นเนื้อของผู้ป่วยจะถูกสุ่มเลือกจากระบบข้อมูลในคอมพิวเตอร์ของภาควิชาสไลด์ในส่วนที่ให้การวินิจฉัยเป็นมะเร็งต่อมลูกหมากในแต่ละรายจะถูกอ่านทบทวน และนำไปย้อมพิเศษทางฮิสโตเคมีเพื่อตรวจหาการสร้างมิวซินกรด โดยใช้การย้อมที่แตกต่างกัน 3 ชนิดดังกล่าว เปรียบเทียบกัน ในรายที่มีการสร้างมิวซินกรด (ย้อมพิเศษทางฮิสโตเคมีได้ผลบวกด้วยวิธีใดวิธีหนึ่ง) จะนำไปย้อมพีเอสเอต่อ ทั้งนี้จะไม่รวมถึงมะเร็งต่อมลูกหมากชนิดย่อยต่าง ๆ (Variants of prostatic adenocarcinoma) และมะเร็งของอวัยวะอื่นที่แพร่กระจายมายังต่อมลูกหมาก

ผลการศึกษา: ร้อยละ 93 (177 ราย) ของมะเร็งต่อมลูกหมากให้ผลบวกต่ออย่างน้อยหนึ่งในสามของการย้อมพิเศษทางฮิสโตเคมีที่ใช้พิสูจน์การสร้างมิวซินกรด ในมะเร็งต่อมลูกหมากที่มีการสร้างมิวซินกรดนี้เมื่อพิจารณาแยกเปรียบเทียบกันในแต่ละการย้อมพิเศษทางฮิสโตเคมีพบว่าร้อยละ 88 (167 ราย) ให้ผลบวกต่อการย้อม mucicarmine ร้อยละ 83 (157 ราย) ให้ผลบวกต่อการย้อม Alcian blue ที่ pH 2.5 และร้อยละ 91 (171 ราย) ให้ผลบวกต่อการย้อม colloidal iron ทุกรายของมะเร็งต่อมลูกหมากที่มีการสร้างมิวซินกรด (177 ราย) ให้ผลบวกต่อการย้อมพีเอสเอ

สรุป: มิวซินกรดในลูเมนพบได้บ่อยในมะเร็งต่อมลูกหมากและการยืนยันด้วยการย้อมพิเศษทางฮิสโตเคมี เป็นหนึ่งวิธีในวิธีการที่มีประโยชน์ในการช่วยวินิจฉัยมะเร็งต่อมลูกหมาก ร่วมกับลักษณะการจัดเรียงตัวและ ลักษณะของเซลล์ mucicarmine และ colloidal iron มีร้อยละของผลบวกสูงกว่า Alcian blue ที่ pH 2.5 จึงน่าจะ ช่วยในการวินิจฉัยได้ดีกว่า อย่างไรก็ตามโดยทั่วไป mucicarmine stain เป็นที่นิยมและใช้กันแพร่หลายมากกว่า colloidal iron stain ซึ่งมีกระบวนการในการเตรียมสีย้อม และการแปลผลที่ยุ่งยากกว่า ในมะเร็งต่อมลูกหมากที่มีการสร้างมิวซินกรดนี้พบว่า ทุกรายให้ผลบวกต่อการย้อมพีเอสเอแสดงว่า ไม่มีความสัมพันธ์กัน แต่การย้อมพีเอสเอยังคงมีประโยชน์ในการยืนยันว่ามะเร็งที่มีลักษณะเปลี่ยนแปลงไปจากเซลล์ปกติอย่างมาก (poorly differentiated carcinoma) หรือ มะเร็งที่แพร่กระจายมายังอวัยวะอื่น (metastatic cancer) ที่พบนั้น มีต้นกำเนิดมาจากต่อมลูกหมาก
