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An audit and re-audit of prostate core biopsies

The College's Clinical Effectiveness Department wishes to encourage high-quality clinical audit. We therefore periodically publish interesting examples of audits that have been successfully evaluated through our clinical audit certification scheme. In this issue we feature an audit and re-audit of prostate core biopsies.

The Royal College of Pathologists' guidelines on the reporting of prostate biopsies were published in October 2009.¹ This article reports an audit (in 2010) and re-audit (in 2013) of prostate core biopsies at the University Hospital of North Tees. Our objectives were:

- to compare our reporting practices against the standards of the Royal College of Pathologists' guidelines for quality assurance purposes
- to assess interobserver variability, especially in Gleason grading and the diagnosis of atypical small acinar proliferation (ASAP).

Audit (2010)

A computer-generated list of all prostate biopsy specimens was obtained for the year 1 January 2010 to 31 December 2010. In total, 101 prostate core biopsy specimens were identified.

Prostate biopsies in our department are reported by four histopathologists. The urology lead reviews these cases before a meeting of the urology multidisciplinary team (MDT) every week. A small proportion of cases are referred to the central MDT by the local MDT. These usually include cases which are offered all options of treatment, including surgery and radiotherapy. These cases are then reviewed by the central MDT pathologist. This central MDT meeting takes place every week at James Cook University Hospital.

All printed reports and slides were obtained. The reports were reviewed and compared with the parameters of the RCPATH dataset.¹ All slides were reviewed for this audit by the local MDT pathologist to compare the results with the review opinion:

- at the local MDT meeting
- at the central MDT meeting
- after the central MDT meeting.

The RCPATH parameters are summarised below:

1. Clinical data
 - number and site of prostate biopsies
 - previous treatment
 - previous biopsies
2. Macroscopic pathology data
 - number of cores or fragments
 - length of cores
3. Microscopic pathology data
 - Gleason sum score (if only one grade is present

it is doubled – for instance if only grade 3 is present it will be 3+3=6; if two grades are present, then both will be included; if there are more than two grades, the third grade is included in the sum score if it is of higher grade)

- presence of tertiary grade
- number and percentage of cores positive per side
- total percentage or greatest percentage
- perineural invasion
- vascular invasion
- involvement of adipose tissue
- if no cancer is present, any features that should lead to consideration of rebiopsy – in particular, high-grade prostatic intraepithelial neoplasia (HGPIN) and foci suspicious of but not diagnostic of adenocarcinoma.

Results

The histopathology reports and all the slides were reviewed by the lead pathologist and consensus opinion taken where there was a difference of opinion. Of the 101 prostate core biopsy specimens, 40 were benign, 50 were malignant, 7 were HGPIN and 4 were ASAP.

The comparison of parameters with the RCPATH dataset yielded the following results:

1. Clinical data
 - number and site of biopsies – information available in all 101 cases (100%)
 - previous treatment – none
 - previous biopsies – 14 cases
 - digital rectal examination (DRE) was mentioned in 63 cases (60%)
2. Macroscopic pathology data
 - number and length of cores was available in all cases (100%)
3. Microscopic pathology data
 - Gleason sum score mentioned in all cases (100%)
 - tertiary pattern was given in 9 cases (16%)
 - number of cores positive for tumour was mentioned in 17 cases (30%)
 - total percentage of tumour given in all cases (100%)

- perineural invasion mentioned in all cases (100%)
- vascular invasion – nil
- involvement of adipose tissue or extra-prostatic extension (EPE) – positive in 5 cases (5%)
- HGPIN reported in 7 cases (7%)
- foci suspicious of adenocarcinoma – 4 cases (4%)
- presence of extra-prostatic tissue (rectal mucosa) mentioned in 5 cases (5%).

Local MDT review

On histology review there was a difference in opinion in one case. In this case Gleason score was upgraded to 3+4=7. This was reported as 3+3=6 adenocarcinoma. This case was discussed at the local MDT meeting.

Central MDT review

Of the 101 cases, 23 were reviewed by the central MDT pathologist. Agreement in diagnosis was reached in 19 of these 23 cases (83%). There was disagreement in the other 4 cases (4%), with a difference in Gleason grading in 3 cases. These cases were upgraded on review from 3+3=6 to 3+4=7. One case was reported as atypia not otherwise specified. However, central MDT review opinion regarded it as atrophy and mild inflammation.

Review after central MDT opinion

Two of these 23 cases were also reviewed after the central MDT review. One case was reviewed at University College London (UCL) and the other at the Royal Victoria Infirmary (RVI), Newcastle. There was no significant difference in these opinions from the initial reviews. The local urologist referred the one case to RVI for laparoscopic prostatectomy surgery, as this procedure was not available in North Tees or James Cook Hospital at that time. The reason for referral of the other case to UCL is not known exactly, but seems to be according to the patient's choice.

Audit review

There was a difference of opinion in four cases on histology slide review. These cases were not reviewed by the central MDT. In two cases there was a difference in Gleason grading. In one of these cases the Gleason score was upgraded from 3+4=7 to 3+5=8. In the second case, the Gleason score was upgraded from 3+3=6 to 3+4=7. One further case showed a small focus of atypical glands primarily reported as benign. In another case both sides showed adenocarcinoma, which was originally reported on one side.

Discussion

The information on three out of four core data items was satisfactory, except digital rectal examination. This was given in 60% of cases. There was

no information on history of previous treatment. It was assumed that none of these patients had any treatment related to prostate disease.

In all cases (100%) both the macroscopic core data features (number of cores and length of cores) were given.

Three out of four core microscopic data features were reported in all cases (100%): Gleason sum score, total percentage of tumour and perineural invasion. However, information on number of positive cores was given only in 30% of cases, which should be provided in all cases according to the dataset. Number of positive cores and total percentage strongly predict the status of excision margin in radical prostatectomy. These parameters are directly proportional to the percentage of tumour in specimens as well as to extra-prostatic extension and seminal vesicle invasion.^{2,3}

Extra-prostatic extension or presence of tumour in fat is difficult to assess in core biopsy specimens. It depends on whether core biopsy contains any fatty tissue. Also, small groups of adipose cells are rarely seen within the prostate. Although there are limitations, according to the RCPATH dataset extra-prostatic extension should be commented on if there is tumour in the fat. In this audit extra-prostatic extension was commented on in seven cases. It was negative in five cases and in two cases it was mentioned that this feature could not be assessed due to absence of fat in the biopsy material.

Vascular invasion was not reported in any of the 56 cases. This feature is not commonly seen in localised disease and has been described as rare by J I Epstein in his book on prostate biopsies.⁴ However, in radical prostatectomy specimens, vascular invasion represents an independent indicator of biochemical recurrence.

Two other features which can lead to consideration of rebiopsy are HGPIN and foci suspicious of adenocarcinoma. HGPIN was mentioned in 12 cases (31%). These include 7 cases (7%) where this was the only feature. A mean of 9% (range 4–16%) has been reported for the United States.⁵ The European Research Screening Study for Prostate Cancer reported figures ranging from 1.5% to 5%.⁶ Foci suspicious of adenocarcinoma were reported in four cases (4%). The evidence shows variation from 0.7% to 23.4% in routine practice. In screening settings, the figure is 2.4–2.6%.

After all the histology reviews, discrepancies were noted in nine cases, six of which involved differences in Gleason grading.

The central MDT review showed a difference of opinion in Gleason grade in three cases. One case was identified at the local MDT review. All these cases were upgraded by one grade, from 3+3=6 to 3+4=7. There was concordance in Gleason grading in 87% of cases. This interobserver variability was compared with a study conducted in the UK by Melia *et al.*⁷ Eight uropathologists reviewed 81

cases. The interobserver reproducibility in Gleason grading was 78%. Allsbrook *et al.*⁸ reported substantial agreement among uropathologists (kappa coefficient 0.56). They also conducted a study among general pathologists and found moderate agreement, with a kappa coefficient of 0.46.⁹ These results are comparable to our figures.

Two cases were identified at the audit review, and both were upgraded (one from Gleason sum 6 to 7 and the other from 7 to 8). One case was reported as benign and the review opinion was small focus of atypical glands. In one case adenocarcinoma was identified which was originally reported on one side. This was discussed at the MDT meeting but as this was low grade (Gleason 6) and low volume (1%) it did not affect patient management.

Conclusion

1. The core prostate biopsy reports provided essential information in almost all cases. These important parameters include Gleason grading with total sum score, total percentage of tumour and perineural invasion. However, one of the core data items, namely number of cores positive for tumour, was not reported consistently.
2. Interobserver variability shows a similar degree of variation to that identified in the literature.

Table 1: Summary comparison of audit results

Results	2010	2013
Total number of cases	101	397
Benign	43 (43%)	158 (39%)
Malignant	54 (53%)	211 (53%)
ASAP	4 (4%)	24 (6%)
HGPIN	7 (7%)	4 (1%)

Table 2: Core clinical and macroscopy data items

	2010	2013
Number and site of biopsies	101 (100%)	397 (100%)
PSA	101 (100%)	397 (100%)
DRE	61 (60%)	251 (63%)
Number and length of cores	101 (100%)	397 (100%)

Table 3: Core microscopy data items

	2010	2013
Gleason sum	101 (100%)	397 (100%)
Number of cores positive for tumour	17 (30%)	394 (99%)
Total % of tumour	101 (100%)	397 (100%)
PNI	101 (100%)	397 (100%)

To increase awareness and to improve reporting, this audit was presented at a journal club meeting of the cellular pathology department, urology department and in the trust clinical governance meeting. These meetings include members of the histopathology department, urologists and members of other surgical and diagnostic teams.

Soon after the audit, the histopathology department started synoptic reporting (Pathosys system) of different types of specimens, including prostate core biopsies. This system is designed to incorporate all RCPATH dataset parameters. The expectation was that more parameters would be recorded according to that dataset with the implementation of Pathosys.

The re-audit (2013)

The aim was to complete the audit loop for the audit done in 2010, with the same two principal objectives (see above).

The same methods were used for the re-audit as in the original audit. Again, a computer-generated list of all prostate biopsy specimens was obtained, this time for the period 1 January 2013 to 31 December 2013. In total, 397 prostate core biopsy specimens were identified.

All printed reports and slides were obtained. For this second audit the slides of cases with a difference in Gleason grading between the local MDT and central MDT were reviewed, to compare the previous review opinion at the local MDT and central MDT meetings.

Results

There was a marked increase in the number of cases between audits, from 101 in 2010 to 397 in 2013. The number of benign and malignant cases was higher in the second audit, but the percentages remained similar (Table 1). Six of the eight core data items were reported in all cases in the first audit (2010). The second audit (2013) found almost 100% reporting of details in seven of the eight core items (Tables 2 and 3). Results for the non-core data items are presented in Table 4. The histology review figures from the two audits are presented in Tables 5 and 6. A comparison of these audits with national and international figures is presented in Table 7.

Discussion

There was an almost four-fold increase in the number of cases, from 101 in the first audit to 397 in the second. However, there was little difference in the percentages of benign and malignant lesions. There was, though, a large difference in the percentage of ASAP cases reported: the figure had almost doubled in the second audit.

Here, information was provided in two out of three core clinical data items. These include number and site of biopsies and PSA levels. DRE was given in just 60% and 63% of cases in the first and second audits, respectively.

Table 4: Non-core data items

	2010	2013
Previous treatment	0	11 (3%)
Previous biopsies	14 (13%)	111 (28%)
Tertiary pattern	9 (16%)	40 (10%)
Vascular invasion	0	0
Extra-prostatic extension	5 (9%)	7 (2%)
Extra-prostatic tissue	5 (9%)	98 (25%)

Table 5: Histology review comparison, 2010 audit

	Local MDT (2/101)	Central MDT (4/23)	Audit review (4/101)
Concordance in Gleason grading	98%	87%	98%
Gleason grade	1 (6-7)	3 (6-7)	2 (6-7)
ASAP	1 (false negative)	1 (false positive)	1 (false negative)
Cancer	0	0	0*

Table 6: Histology review comparison, 2013 audit

Variables	Local MDT (4/211)	Central MDT (13/64)	Audit review (4/211)
Gleason grading concordance	207 (98%)	51 (78%)	207 (98%)
Gleason grade discordance	4 (2%) (1 grade upgraded)	10 (5%) (1 upgraded; 9 downgraded)	4 (2%) (2 upgraded; 2 downgraded)
ASAP	0	2 (1-ASAP to benign) (1-6 to ASAP)	0
Cancer	0	1- ASAP to ACA (6)	0

Table 7: Histology review comparison of two audits against standards

	First audit (2010)	Second audit (2013)	Standards
HGPIN (%)	7	1	9 (United States); 5.1.5-5 (Europe) 6
Gleason grading concordance (%)	87	78	78 (UK); 7 >70% Allsbrook 8,9
ASAP (%)	4	6	3-5
False-negative cancer rate	0	1 (0.25)	1.1
Core data items	6	7	8

Macroscopic details were available in all cases in both audits.

Concerning the microscopic data, the Gleason sum score was given in all cases. The number of cores positive for tumour was given in only about 30% of cases in the first audit but this increased to nearly 100% in the second audit. This feature predicts surgical margin status in radical prostatectomy specimens.² The information for the two other core microscopic data items (total percentage of tumour and PNI) was given in all cases.

Tertiary pattern was given in 16% and 10% of cases in 2010 and 2013, respectively. The literature reports rates for this pattern of 5% and in another study in 13% of cases; Gleason himself identified more than two patterns in about 50% of cases.

Vascular invasion was not identified in either audit. Bostwick mentioned this feature only in the radical specimens.⁵ However, Epstein has described this as a rare occurrence in core biopsies.⁴ This is an independent prognostic marker and is related to biochemical recurrence of tumour.⁴

HGPIN was reported in 7% of cases in the first audit and 1% in the second. The unifocal finding of HGPIN does not require a rebiopsy. This is advocated in multifocal HGPIN. This becomes even more significant in ERG-positive cases.

The concordance in Gleason grading between the local MDT and central MDT was 87% and 78% in the first and second audit respectively.

ASAP was reported in 4% of cases in the first and 6% in the second.

Overall, six of the eight core data items were reported in all cases in the first audit and seven of the eight in the second audit (Table 7).

Summary

- Clinical data information was satisfactory except for DRE. Seven of eight core data items were reported in re-audit.
- Macroscopic details were provided in all cases.
- All essential microscopic information was available in all cases, including Gleason grade, tumour percentage and PNI. Information on number of cores involved by tumour was given in almost all cases at the re-audit.
- This improvement in reporting patterns is partly attributed to the introduction of the Pathosys synoptic reporting system, in which parameters are recorded according to RCPATH dataset. The second audit used this system to capture some of the data.
- Interobserver variability is comparable to national and international figures.

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Dr Jumoke Sule

Experience with submitting audits to the RCPATH audit certification scheme

Introduction

The Royal College of Pathologists for many years has offered a scheme for certification of clinical audit. A consultant of mine while training (Dr Hugo Ludlam) was particularly active in clinical audit and regularly sent audits to the College for evaluation. Since then, it has been a natural thing for me to do and to encourage others to do in my role as laboratory clinical audit lead.

I started training as a microbiologist in the mid-1990s in a department that undertook a lot of clinical audit activity. During this time clinical audit was being promoted as an essential part of our work and in 1998 the Department of Health published *A First Class Service: Quality in the New NHS*. In that document, a new framework for clinical governance was proposed and the National Institute for Clinical Excellence (NICE; now the National Institute for Health and Care Excellence) was instituted as an arm's length 'special health authority' to take on the work of the National Centre for Clinical Audit.

In 1999, I attended my first formal training course in clinical audit at the College, run by

Healthcare Quality Quest. I still keep the training booklet used during the course. I have also kept a check-list for good practice while planning clinical audit produced by the National Centre for Clinical Audit in 1997. These booklets remain useful, as teaching around clinical audit now is really no different to what it was then. I guess the main changes are the focus on clinical audit as only part of quality improvement, with many other tools available (e.g. the plan-do-study-act cycle and service evaluation). There is a greater emphasis placed on root cause analysis to identify shortcomings and to suggest recommendations. Re-audit should also be part of the audit cycle, to demonstrate that improvements have been made.

Benefits of submitting clinical audit for evaluation

There are many benefits derived from sending an audit to the RCPATH for evaluation of quality or certification. These are both personal and organisational. Peer review is an important benefit, as it is one of the ways in the current era to demonstrate competency in one's role.