The Potential Usefulness of Pre and Post Operative Risk Group Stratification in Predicting PSA Failure after Radical Prostatectomy for Localised Prostate Cancer

Corresponding Author:
Mr. Anthony Kodzo - Grey Venyo,
Urologist, Urology Department. North Manchester General Hospital - United Kingdom

Submitting Author:
Mr. Anthony Kodzo - Grey Venyo,
Urologist, Urology Department. North Manchester General Hospital - United Kingdom

Article ID: WMC003223
Article Type: Audit
Submitted on: 10-Apr-2012, 03:40:03 AM GMT   Published on: 10-Apr-2012, 05:41:34 PM GMT
Article URL: http://www.webmedcentral.com/article_view/3223
Subject Categories: UROLOGY
Keywords: Adenocarcinoma, Prostate, Risk-Group, Stratification, PSA, Failure, Radical Prostatectomy


Copyright: This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Source(s) of Funding:
None

Competing Interests:
We have no competing interests to declare.

Additional Files:
The Potential Usefulness of Pre and Post Operative
The Potential Usefulness of Pre and Post Operative Risk Group Stratification in Predicting PSA Failure after Radical Prostatectomy for Localised Prostate Cancer

Author(s): Venyo A, Imran S, Shah S, Gordon R, Barnes D

Abstract

Background: There is no clear cut way of predicting exactly prior to radical prostatectomy which patients would subsequently develop Biochemical failure post operatively.

Aims: To investigate the usefulness of Risk Group stratification based upon: pre-operative PSA, clinical staging and Gleason score assessment of prostate biopsy specimens taken at Trans-rectal ultrasound of prostate in predicting PSA failure post-operatively.

To ascertain whether or not risk group stratification using radical prostatectomy specimen would be more useful in predicting PSA failure.

Patients and Methods: Fifty patients underwent radical prostatectomy as treatment for localised adenocarcinoma of prostate between 1999 and January 2006. The patients were followed up over a period of time ranging from 4 month to 7 years. The clinical records were reviewed to ascertain the PSA failure in the aforementioned risk groups.

Statistical analysis was done to compare the PSA failure rates in both risk stratification groups.

Results: Pre-operative Risk Group Stratification 19%, 19%, 37.8% of patients in the low-, intermediate-, and high- risk groups developed PSA failure.

Post-operative Risk Group Stratification None of the 10 and 17 patients in low-risk, and intermediate-risk groups respectively developed PSA failure and 11 out of 23 patients (48%) in the high risk group developed PSA failure.

Conclusions: Post-operative Risk Group Stratification statistically is more reliable in predicting PSA failure. Patients in the post-operative high risk group would most likely develop PSA failure and should be advised to have adjuvant therapy. Patients in the low-risk group most likely would not develop biochemical failure and may therefore not require adjuvant therapy.

Introduction

Radical prostatectomy has gained wide acceptance throughout the world as one of the most useful available treatment modalities for localised prostate cancer. But unfortunately, about a third of men treated with radical prostatectomy later experience progression of their disease. Usually, the first indication that the disease has progressed or is progressing is a subsequent detectable level of serum prostate specific antigen (PSA) measured months or years after the radical prostatectomy. It would be helpful if practitioners could find a way of identifying or predicting accurately at an earlier stage those patients who would subsequently develop PSA failure or PSA recurrence then such patients can be given adjuvant therapy early with the aim of preventing or delaying PSA and tumour recurrence. This study has retrospectively assessed the potential usefulness and reliability of the pre and post operative Risk-Group-Stratification based upon a combination of serum PSA, Gleason Score and stage of tumour in predicting subsequent PSA failure / recurrence after radical prostatectomy for localized prostate cancer in our initial 50 patients who undergone radical prostatectomy for localised disease.

Patients Materials and Methods

Patients

A retrospective analysis was done using the clinical records; laboratory results; radiology records of all the initial 50 patients with localised adenocarcinoma of prostate who underwent standard radical retro-pubic prostatectomy between 1999 and 2005 at North Manchester General Hospital. The operation was performed by one consultant Urologist.

All the patients were pre-operatively assessed with initial outpatient consultation which included: clinical history taking; clinical examination including digital...
rectal examination to assess the prostate gland; Serum PSA checks; trans-rectal ultrasound scan of prostate and prostate biopsies; CT scan/ MRI scan of abdomen and pelvis. The results of the patient’s histology reports, CT scans and the patients’ general state of health and co-morbidities were discussed at a Multi-Disciplinary Team Meeting and the options of management outlined. All the patients were seen again in the out-patients clinic and the options of management and outcome of all the management options were discussed including complications and recurrence. All the patients chose radical prostatectomy and after counselling underwent radical prostatectomy pursuant to which they were followed up at regular intervals with a mean follow up of 28.7 months (range 4 months to 7 years).

The average age range of the patients was 62 years; 1 patient was aged >70 years; 14 patients were aged between 66 and 70 years; 15 patients were aged between 61 and 65 years; 13 were aged between 56 and 60 years; 6 were aged between 50 and 55 years; 1 was less than 50 years old.

Methods
The following data were recorded:

The initial serum PSA at the time of trans-rectal ultrasound scan of prostate and all PSA values from the onset up to the end of study

The clinical stage of the tumour determined at time of the pre-operative counselling based upon the clinical examination findings, trans-rectal ultrasound scan finding, CT / MRI scan finding and histology report.

The pre-operative Gleason grade and score of the tumour based upon the Trans-rectal ultrasound scan biopsy specimen

The post-operative Gleason grading and score of the tumour based upon results of histological examination of the radical prostatectomy specimens.

The clinical stage of the tumour based upon the intra-operative findings and histological examination findings of the radical prostatectomy specimens.

Based upon the results of the patients serum PSA, pre-operative clinical stage (or post-operative clinical stage in the case of radical prostatectomy specimen) and Gleason score of the trans rectal ultrasound biopsy specimen (or the radical prostatectomy specimen for post-prostatectomy stratification) the patients were allocated to three different groups as low risk; intermediate risk and high risk groups which were defined as:

- The outcome of the patients were recorded as (a) no biochemical failure, (b) biochemical failure [PSA value of 0.2 ng/ml and second PSA value higher than 0.2 ng/ml or two consecutive PSA rises above the PSA nadir. The time interval between the retro-pubic radical prostatectomy and the Biochemical (PSA) failure were recorded including any other patient outcome regarding progress of tumour or death.

Analysis of data included calculation of percentage of patients in each risk group that subsequently developed Biochemical (PSA) failure. Statistical analyses of the results were done using sure start to compute the following analyses: Nominal Independence, Anova, Linear Trend, Nominal Association, and Ordinal.

Results

During the period of follow-up 11 patients (22%) developed PSA failure and one of these patients died of his prostate cancer but the remaining 10 patients were free of clinical disease and they were either referred for adjuvant therapy or have been receiving adjuvant therapy. The only patient who died of his prostate cancer was initially treated with radical radiotherapy prior to his radical prostatectomy however, he developed PSA (Biochemical) failure and he then opted to undergo radical prostatectomy. He also continued to be on hormonal treatment but died. With regard to the ten patients who developed PSA failure the outcomes were as follows:

- One patient developed PSA failure by the 6th post operative period with PSA values of 0.681 ug/L, [ng/ml], and 1.95 ug/L, [ng/ml]. He was referred to the Oncologist and has been treated by radical radiotherapy and he is also receiving hormonal therapy.
- One patient developed PSA failure at 4 months with serum PSA of 0.22 ug/L. He was referred to the oncologist and he had undergone radical radiotherapy and is receiving hormonal treatment as well. His last serum PSA was < 0.050 at the time of the study.
- One patient developed PSA failure at 33 months and has received radical radiotherapy as well as he is on hormonal treatment. His last 3 serum PSAs were
- One patient developed PSA failure at 4 months post operatively and was referred to the oncologist following which he received radical radiotherapy. His last serum PSA was >0.050 ug/L.
- One patient developed PSA failure 7 years post operatively and had just been referred to the oncologist.
- One patient developed PSA failure 4 years post operatively and had just been referred to the oncologist.
- One patient developed PSA failure 3 years post operatively and was referred to the oncologist following which he received radical radiotherapy. His
last 3 serum PSA levels have been:

- One patient developed PSA failure 8 months post operatively; he was referred to the oncologist and he received radical radiotherapy; his last 2 serum PSA levels were
- One patient developed PSA failure 2 months post operatively; he was referred to the oncologist and he received radical radiotherapy and is also on hormonal treatment. His last 3 serum PSA levels were
- One patient developed PSA failure 2 years post operatively; he was referred to the oncologist and he received radical radiotherapy. His last serum PSA was

Out of the 50 patients who underwent radical prostatectomy 21 were assigned to the low risk group, 21 were assigned to the intermediate risk group and 8 were assigned to the high risk group based upon risk group stratification using the pre-operative PSA, Gleason score of the pre-operative trans-rectal ultrasound scan biopsy specimen and the clinical stage of the tumour. With regard to 21 patients assigned to the low risk group, 4 patients developed PSA (biochemical) failure subsequently and 17 did not develop PSA (biochemical) failure. Out of the 21 patients assigned to the intermediate risk group, 4 patients developed PSA (biochemical) failure and 17 patients did not develop PSA failure. Out of 8 patients assigned to the high risk group, 3 developed PSA failure and 5 did not develop PSA failure. These results showed that in comparison with patients who were assigned to the low or intermediate risk group, patients who were assigned to the high risk group had just under double the percentage PSA failure rate (37.55 [high risk group] versus 19% [low and intermediate risk$ group] (see table 1).

Various statistical analyses were done in relation to PSA failure and non failure based upon the pre-operative trans-rectal ultrasound prostate biopsy specimens using sure start including Nominal Independence, Anova, Linear trend, Nominal association, and ordinal which revealed that the differences in outcome were not significant. Data on the statistical analyses with sure start is shown below:

**Discussion**

The judgement of which patients are at high risk for failure after radical prostatectomy has traditionally been based largely upon the final pathologic stage [1]. Partin and associates [2] stated that final pathologic state alone is a problematic variable for judging high-risk disease in view of the fact that some patients with apparently organ-confined cancer will later develop disease recurrence, and many patients with non-organ-confined cancer will remain disease-free [3].

It has been stated that not all patients with prostatic capsular invasion (PCI) or seminal vesicle involvement, are destined to have disease recurrence after radical prostatectomy. [4], [5], [6], [7], [8], [9]. In view of this it would be argued that the use of individual pathologic features related to a prostate cancer would be insufficient to estimate the risk of recurrence and that there is the need to combine a number of pathologic factors as a risk group stratification approach.

Stein and associates [10] stated that pursuant to radical prostatectomy designed to cure the patient of his cancer, the serum PSA level should become undetectable.

Partin and associates [8] intimated that measurable levels of PSA after surgery provide evidence of disease recurrence that may precede detection of local or distant recurrence by many months to many years.

The use of PSA test has become an invaluable blood tumour marker and follow-up tool ensuing definite treatment. The serum level of PSA pursuant to a radical prostatectomy of locally organ-confined prostate cancer should fall to undetectable levels. In view of the fact that the half life of PSA in the blood is 3 days, the lowest level of serum PSA should be reached four to six weeks after complete excision of surgery [11], [12].

If the PSA is still detectable in serum after 6 weeks, this may be indicative that there is residual cancer. Post-operative PSA is defined as undetectable based upon the lowest residual cancer detection limit of each commercial assay kit of the PSA test but it is not standardized and ranges from 0.1 to 0.6 ng/ml even though, 0.2 or 0.3 ng/ml is most commonly used [13],
Amling and associates [17] compared and analyzed values of PSA of 0.2 and 0.4 ng/ml and the outcomes showed disease progression-free rates at five and ten years of 14% and 16%, difference respectively. Whether or not the determination is set at a single PSA reading of ?0.4 ng/ml or 2 PSA tests of ? 0.4 ng/ml, the respective five- and ten-year prognoses still differed at 7% and 18%. Therefore some patients whose PSA falls to 0.3 to 0.4 ng/ml, or with an occasional PSA of >0.4 ng/ml, might still be free of recurrence.

The general consensus of opinion has been leaning towards using serum-PSA of 0.4 ng/ml as the acceptable biochemical diagnostic PSA-cut-off point for recurrence of the prostatic carcinoma. However, Yang [18] is of the opinion that 2 or more PSA values showing an increase are necessary before beginning additional therapy and following up with further confirmation is also required.

Iselin and associates [19] have stated that when PSA values of patients rise after surgery and biochemical recurrence is diagnosed, if treatments are not administered in a timely manner, then the future clinical discovery of local recurrence or metastasis can range from 7 months to 6 years, while the estimated period of death from prostate cancer can range from 5 to 12 years. At this stage, CT scan, magnetic resonance imaging (MRI), and bone scan are all diagnostically ineffective [20].

The results of this study are of clinical significance in that it has shown that:

Patients assigned to the high risk group have a higher chance/risk of developing PSA failure post operatively.

The risk group stratification based upon the pre-operative trans-rectal ultrasound scan prostate biopsy stratification may provide a useful guide to PSA failure however, this may not be an accurate indicator of outcome in that a number of patients who were assigned to the low-risk group who developed PSA failure upon subsequent examination of the radical prostatectomy specimens (whole prostate) had up-grading and or up-staging of their tumours upon.

Risk group stratification based upon the radical prostatectomy is useful way of identifying the group of patients who would most likely develop PSA failure from those who would not in that none of the patients in the low-risk group and intermediate-risk group developed PSA failure and 11 out of 23 patients (48%) of patients assigned to the high risk group developed PSA failure.

### Conclusions

Risk-group stratification of patients with localised prostate cancer is a useful way of predicting the likelihood of the subsequent development of PSA (biochemical) failure after radical prostatectomy.

Risk-group stratification based upon the pre-operative prostate biopsy specimen may be an indicator of subsequent PSA failure post-operatively due to upgrading or upstaging which may occur after examination of the radical prostatectomy specimen.

Risk-group stratification based upon the radical prostatectomy specimen would be most useful in predicting PSA failure.

Patients assigned to the high-risk group after examination of their radical prostatectomy specimens would belong to the group who should be given adjuvant therapy because of the high likelihood of subsequent PSA failure in this.

Patients assigned to the low- and intermediate- risk group based upon examination of the radical prostatectomy specimens would not need to have adjuvant therapy in view of the unlikelihood of their subsequent development of PSA failure.

### References


Acknowledgements

We would like to acknowledge the Audit Department of North Manchester General Hospital and Dr Sarah Cotterill Research Fellow in biostatistics, in the Health Science Research Group at the University of Manchester. Dr Sarah Cotterill is an adviser for the NIHR Research Design Service, supporting the National Health Service (NHS) staff in the North West Deanery and other researchers. Dr Sarah Cotterill of the Research and Development unit, Clinical Sciences Building, Salford Royal Hospital in the United Kingdom performed all the statistical analyses and we are grateful to her.

Authors contributions

The study was designed by Mr Anthony K-G Venyo who adopted the North West Regional Prostate Cancer Audit proforma and who discussed the audit project with Drs Sarang Shah and Shahid Imran, Mr Douglas Barnes as well as the Audit Department of North Manchester General Hospital. Mr Anthony Kodzo-Grey Venyo explained in detail to Drs Sarang Shah and Sharid Imran the Gleason Grading / Scoring System, as well as the Staging of Prostate Cancer to Drs Sarang Shah and Shahid Imran. All the Radical prostatectomies were performed by Mr D G Barnes and Mr Anthony Kodzo-Grey Venyo assisted at some of the operations as well as reviewed some of the
patients post-operatively. Mr Anthony Kodzo-Grey Venyo supervised Drs Sarang shah and Dr Shahid Imran to collect and enter all the data. Mr Anthony Kodzo-Grey Venyo cross checked all the clinical entry, laboratory results, radiology results, the PSA levels, Gleason Scores, clinical staging and patient outcome as the subsequent PSA levels entered by both Drs Shah and Imran and all three were in agreement regarding the entries of every patient. The raw data was given to the audit Department for entry into a spread sheet format and analysis of Data without knowledge of all the clinicians. Ruth Gordon did all the analyses and entry of the results with the exception of the statistical analyses. Mr Douglas Barnes reviewed all the patients at initial and subsequent follow-ups and Mr Anthony Kodzo-Grey Venyo also reviewed some of the patients at some stage in the follow-up of some of the patients. Mr Anthony kodzo-Grey Venyo wrote the manuscript which was then read by all authors who were in agreement of the contents. Dr Sarah Cotterill explained to Mr Anthony Kodzo-Grey Venyo the appropriate statistical analyses pertinent to our data based upon the numbers involved. Dr Sarah Cotterill did all the statistical analyses in the presence of Mr Anthony Kodzo-Grey Venyo and cross checking that all the results were correctly entered for the statistical analyses.
Illustrations

Illustration 1

Statistical analyses of outcome (PSA failure and non failure) post radical prostatectomy for localised prostate cancer in relation to Risk Group Stratification of trans-rectal ultrasound scan prostate biopsy specimens (biopsy specimens only) Contingency table analysis

<table>
<thead>
<tr>
<th></th>
<th>Observed</th>
<th>Expected</th>
<th>% of row</th>
<th>% of col</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17</td>
<td>16.38</td>
<td>80.95%</td>
<td>43.59%</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>4.62</td>
<td>19.05%</td>
<td>36.36%</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td></td>
<td>100%</td>
<td>42%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Observed</th>
<th>Expected</th>
<th>% of row</th>
<th>% of col</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>6.24</td>
<td>62.5%</td>
<td>12.82%</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1.76</td>
<td>37.5%</td>
<td>27.27%</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td>100%</td>
<td>16%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>39</td>
<td>11</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>78%</td>
<td>22%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TOTAL number of cells = 6

Warning: 3 out of 6 cells have EXPECTATION < 5

**NOMINAL INDEPENDENCE**
- Chi-square = 1.333389  DF = 2  P = 0.5134
- G-square = 1.205117  DF = 2  P = 0.5474
- Fisher-Freeman-Halton exact  P = 0.4814

**ANOVA**
- Chi-square for equality of mean column scores = 0.77118  DF = 1  P = 0.3799

**LINEAR TREND**
- Sample correlation (r) = 0.125453
- Chi-square for linear trend (M²) = 0.77118  DF = 1  P = 0.3799
### NOMINAL ASSOCIATION

- \( \Phi = 0.163303 \)
- Pearson's contingency = 0.161168
- Cramér's \( V = 0.163303 \)

### ORDINAL

- Goodman-Kruskal gamma = 0.223022
- Approximate test of gamma = 0: SE = 0.285145 \( P = 0.4341 \) 95% CI =
  -0.335851 to 0.781895
- Approximate test of independence: SE = 0.297551 \( P = 0.4535 \) 95% CI =
  -0.360168 to 0.806212
- Kendall tau-b = 0.107387
- Approximate test of tau-b = 0: SE = 0.141751 \( P = 0.4487 \) 95% CI =
  -0.17044 to 0.385214
- Approximate test of independence: SE = 0.143274 \( P = 0.4535 \) 95% CI =
  -0.173425 to 0.388199
Illustration 2

Statistical analyses of outcome (PSA failure and non failure) based upon Risk group stratification of radical prostatectomy specimens (whole prostate)

Contingency table analysis

<table>
<thead>
<tr>
<th></th>
<th>Observed</th>
<th>Expected</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>7.8</td>
<td>10</td>
</tr>
<tr>
<td>% of row</td>
<td>100%</td>
<td>0%</td>
<td>20%</td>
</tr>
<tr>
<td>% of col</td>
<td>25.64%</td>
<td>0%</td>
<td>20%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Observed</th>
<th>Expected</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17</td>
<td>13.26</td>
<td>17</td>
</tr>
<tr>
<td>% of row</td>
<td>100%</td>
<td>0%</td>
<td>34%</td>
</tr>
<tr>
<td>% of col</td>
<td>43.59%</td>
<td>0%</td>
<td>34%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Observed</th>
<th>Expected</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12</td>
<td>17.94</td>
<td>23</td>
</tr>
<tr>
<td>% of row</td>
<td>52.17%</td>
<td>47.83%</td>
<td>46%</td>
</tr>
<tr>
<td>% of col</td>
<td>30.77%</td>
<td>100%</td>
<td>46%</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>11</td>
<td>50</td>
</tr>
<tr>
<td>-------</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>% of n</td>
<td>78%</td>
<td>22%</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL number of cells = 6

Warning: 2 out of 6 cells have EXPECTATION < 5

NOMINAL INDEPENDENCE

Chi-square = 16.555184 DF = 2 P = 0.0003
G-square = 20.849518 DF = 2 P < 0.0001
Fisher-Freeman-Halton exact P = 0.0002

ANOVA

Chi-square for equality of mean column scores = 12.775342
DF = 1 P = 0.0004

LINEAR TREND

Sample correlation (r) = 0.510609
Chi-square for linear trend (M²) = 12.775342
DF = 1 P = 0.0004
<table>
<thead>
<tr>
<th>NOMINAL ASSOCIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phi = 0.575416</td>
</tr>
<tr>
<td>Pearson's contingency = 0.498742</td>
</tr>
<tr>
<td>Cramér's V = 0.575416</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ORDINAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goodman-Kruskal gamma = 1</td>
</tr>
<tr>
<td>Approximate test of gamma = 0: SE = 0 P = * 95% CI = * to *</td>
</tr>
<tr>
<td>Approximate test of independence: SE = 0.218966 P &lt; 0.0001 95% CI = 0.570834 to 1.429166</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Kendall tau-b = 0.509847</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate test of tau-b = 0: SE = 0.071717 P &lt; 0.0001 95% CI = 0.369283 to 0.65041</td>
</tr>
<tr>
<td>Approximate test of independence: SE = 0.111639 P &lt; 0.0001 95% CI = 0.291038 to 0.728655</td>
</tr>
</tbody>
</table>
Illustration 3

Table 1 and Table 2

PSA (Biochemical) Failure rate following radical prostatectomy in relation to pre-radical prostatectomy (post-trans-rectal ultrasound scan biopsy) risk group stratification. Outcome of 50 patients who underwent radical prostatectomy for localized prostate cancer between December 1999 and January 2006 with a follow up ranging from 4 months to 7 years and mean follow up of 28.7 months

<table>
<thead>
<tr>
<th>Risk Group</th>
<th>PSA Non Failure (Normal PSA)</th>
<th>PSA Failure</th>
<th>Total</th>
<th>Percentage Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Risk</td>
<td>17</td>
<td>4</td>
<td>21</td>
<td>19%</td>
</tr>
<tr>
<td>Intermediate Risk</td>
<td>17</td>
<td>4</td>
<td>21</td>
<td>19%</td>
</tr>
<tr>
<td>High Risk</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>37.5%</td>
</tr>
</tbody>
</table>
PSA (Biochemical) Failure rate following radical prostatectomy in relation to post radical prostatectomy risk group stratification. Outcome of 50 patients who underwent radical prostatectomy for localized prostate cancer between December 1999 and January 2006 with a follow up ranging from 4 months to 7 years and mean follow up of 28.7 months.

<table>
<thead>
<tr>
<th>Risk Group</th>
<th>PSA Non Failure (Normal PSA)</th>
<th>PSA Failure</th>
<th>Total</th>
<th>Percentage Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Risk</td>
<td>10</td>
<td>0</td>
<td>10</td>
<td>0%</td>
</tr>
<tr>
<td>Intermediate Risk</td>
<td>17</td>
<td>0</td>
<td>17</td>
<td>0%</td>
</tr>
<tr>
<td>High Risk</td>
<td>12</td>
<td>11</td>
<td>23</td>
<td>48%</td>
</tr>
</tbody>
</table>
Disclaimer

This article has been downloaded from WebmedCentral. With our unique author driven post publication peer review, contents posted on this web portal do not undergo any prepublication peer or editorial review. It is completely the responsibility of the authors to ensure not only scientific and ethical standards of the manuscript but also its grammatical accuracy. Authors must ensure that they obtain all the necessary permissions before submitting any information that requires obtaining a consent or approval from a third party. Authors should also ensure not to submit any information which they do not have the copyright of or of which they have transferred the copyrights to a third party.

Contents on WebmedCentral are purely for biomedical researchers and scientists. They are not meant to cater to the needs of an individual patient. The web portal or any content(s) therein is neither designed to support, nor replace, the relationship that exists between a patient/site visitor and his/her physician. Your use of the WebmedCentral site and its contents is entirely at your own risk. We do not take any responsibility for any harm that you may suffer or inflict on a third person by following the contents of this website.