



The 10 Myths about Proton Therapy

There is some extraordinary misinformation about proton therapy in the media and even many doctors are uninformed or misinformed about proton therapy. In an effort to help newly diagnosed men and shed light on this misinformation, we recently began running a series of articles about the ten most common misrepresentations, or myths, about proton therapy for prostate cancer. Each month we examine one of these myths and set the record straight based on facts, published data, and our own patient surveys.

Myth #1:

Proton therapy is experimental and investigational. It is a new, untested science.

This is perhaps the most common myth about proton therapy. It happens to be the excuse many health insurers use to deny coverage for proton therapy for prostate cancer. Of course, the real reason behind the denial is that the *initial* cost for proton therapy is higher than conventional radiation, but they won't admit that. So they hide behind the pretense that proton therapy is "experimental" and they have a stated policy of not reimbursing for experimental medical procedures.

If the patient accepts this claim and chooses IMRT or some other form of treatment, then the insurance company wins and the patient loses. If patients fight the denial through the appeals process, and do it smartly, they almost always win. Some choose not to go through the appeals process because they are anxious about their diagnosis, and want to get treated sooner rather than later. So they accept defeat and choose another option. We call this "denial by delay" and it works well for many insurers.

So, where is truth? Is proton treatment new, experimental, or investigational? The answer is "no" on all counts.

Here are some facts:

- Berkeley Radiation Laboratory treated the first patient with protons in 1954.
- Harvard University treated its first patients in 1961.

- Loma Linda opened the first hospital based proton treatment center in 1990.
- 84,000 patients have been treated with proton therapy through the end of 2011.
- There are 10 operating proton centers in the U.S., 10 more under construction and 9 more in the planning stage.
- There are 33 proton centers operational worldwide with dozens more planned.
- Proton radiotherapy has been the topic of 3,000 papers since 1954.
- Proton therapy was FDA approved for use in the U.S. in 1988—24 years ago.
- Medicare and about 180 private insurers consider proton therapy an established technology, and have been reimbursing for proton therapy for more than 20 years.

So, is proton therapy experimental and investigational? Hardly. Proton therapy has been around for almost 60 years; tens of thousands of patients have been treated—mostly prostate cancer patients; it is FDA approved, reimbursed by Medicare and 180 private insurers; and reputable medical centers all over the world have embraced the technology and are building proton centers. This does not sound like a technology that is experimental, investigational, or untested science.

As BOB member, **Jim Landry**, wrote in his Proton Pals newsletter last month, “*When your insurance company says this treatment is experimental you can point out that it was experimental in 1954, show them the picture (on the right) from the Berkeley Radiation Laboratory and then tell them how many patients have been treated, a very high percentage of which were for prostate cancer.*”



Proton Therapy in 1954



Proton Therapy Today

Myth #1 ...



Myth #2:

Proton therapy is significantly more expensive than conventional radiation treatments.

What Do They Really Cost?

It's nearly impossible to pinpoint the cost of IMRT or proton therapy for treating prostate cancer. Why? Because reimbursement rates vary widely between individual private insurers, and between private insurers and Medicare; they also vary from region to region; and they vary between hospital-based and free-standing treatment centers.

Rates also vary depending on the number of fractions (treatments) delivered. The cost to treat a patient involved in a hypo-fractionation (20-24 treatment) protocol will be considerably lower than cost to treat a patient receiving the standard, 44 treatments.

In a presentation given by **Andrew Lee, M.D., MPH**, Associate Professor from MD Anderson Cancer Center at the annual American Society for Radiation Oncology (ASTRO) meeting last year, he reported the initial cost to treat prostate cancer protons is \$8,000 higher than treating with IMRT. **Dr. Steven Pearson** and **Dr. Peter Bach**, formerly with the Centers for Medicare and Medicaid Services (CMS) confirm this difference.

Initial Cost vs. Total Cost

So, the initial cost to treat with protons is approximately \$8,000 higher than treating with IMRT. But what about total cost to private insurers and Medicare? What about follow-up costs and hospitalizations for treating higher levels of impotence, rectal issues, incontinence, and other side effects that are more prevalent with IMRT?

Our survey of BOB members showed no difference in urinary function or bowel function between men treated with protons and men who received no treatment at all. And while there were some changes in sexual function for a small fraction of respondents, most of this was connected with members on hormonal therapy, older members, and members with the most aggressive cancers. Our 2009 survey showed only 4% of members with impotence.

And what about the cost of diapers for incontinence, and over-the-counter medications for pain and discomfort resulting from the other treatments? These costs also add up over time.

Proton Cure Rates

In Dr. Lee's presentation, he cited statistics from prospective studies comparing protons to X-rays in treating prostate cancer. With today's proton treatment protocols, he showed 92% disease free survival rates at seven years for the patient population studied (*JAMA* 299, 2008). For low risk patients, he reported 95% disease free survival at nine years (*J Clinical Oncology* March 2010). This is consistent with other studies that show disease free survival rates at 94% at ten years with proton. A recent study at the University of Florida showed 99% disease free survival rate for low risk prostate cancer patients at five years. These results are phenomenal. We doubt IMRT rates are this good. How do you put a price tag on disease free survival?

How Do You Put a Cost On Quality of Life?

According to Dr. Lee's report, not only was cancer control superb, but morbidity (side effect) control was equally superb. Grade 2 or greater gastrointestinal side effects with proton were almost half that of X-rays. Grade 3 or greater gastrointestinal side effects 86% lower with protons, and genitourinary side effects 75% lower with protons. This is consistent with many other published studies.

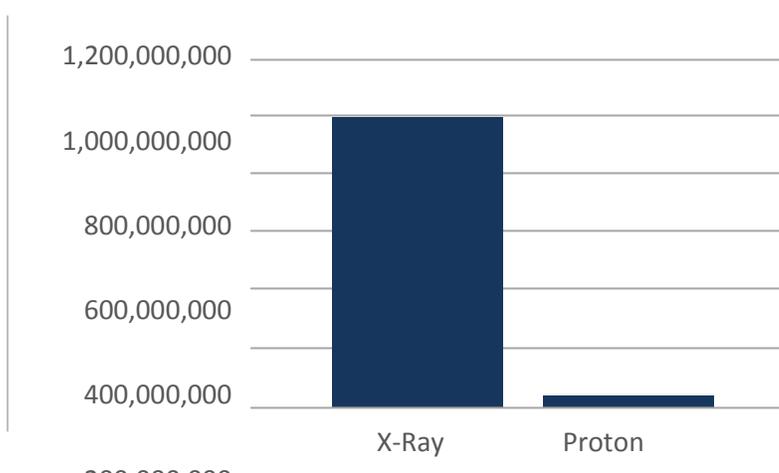
He further reported on a study (*Chung et. al. ASTRO 2008*) that showed that because less radiation is deposited on healthy tissue, the probability of secondary cancers with protons is less than half that of X-rays.

Therefore, the likelihood of urinary, rectal, sexual side effects, and secondary cancers is lower with proton.

Medicare Costs

In 2010, Medicare spent \$1.06 billion on conventional (X-ray) radiation therapy. That same year, Medicare spent \$41.8 million on proton therapy, or less than 4% of X-ray cost. Certainly there were far fewer patients treated with protons than with X-rays, but the numbers show that the bulk of Medicare money is being spent on X-ray radiation. All the while, significant advances are being with proton technology to improve cure rates, reduce side effects, and lower costs.

Medicare Costs 2010 X-Ray vs. Proton Therapy



Cost is Coming Down

There are advances being made through proton hypo-fractionation clinical trials. Studies are underway at three U.S. proton centers where they are treating patients with higher daily doses and fewer fractions. Early results are extremely positive, and it is likely that within a few years this new, shortened treatment protocol will be adopted at all proton centers. This means the cost to treat with protons will likely drop to the same level as IMRT, and maybe even lower.

That's how technology works. Through research and clinical trials, new treatment protocols are developed, cure rates are improved, treatment times are shortened, and costs are lowered. Much of this research has been funded through BOB member gifts. You are making a difference.

Bottom line

Proton therapy is NOT significantly more expensive than IMRT. Initial cost to treat with protons today is a few thousand dollars higher. Even if proton therapy were twice the cost of IMRT, the long term (total) cost is probably comparable, and maybe even lower than IMRT. And, unquestionably, when shorter treatment

protocols are adopted and other technology improvements are implemented, proton *initial* costs will be at the IMRT level, or lower. Add to that, higher quality of life with proton therapy and the cost argument disappears.

Conclusions

- Proton therapy today costs a few thousand dollars more ... initially.
- Following treatment, most proton patients require zero follow-up medical attention for side effects and, complications. This follow-up medical treatment after conventional radiation and surgery often costs thousands of dollars in doctor/hospital bills, medical procedures, diapers, catheters, E.D. medications, and other costs. Often this increases total cost to levels much higher than proton therapy.
- You can't put a price tag on quality of life after treatment, maintaining urine control and sexual function.
- The chance of secondary cancers from IMRT are double that of proton. Secondary cancers cause severe quality of life problems and cost tens of thousands of dollars to treat.
- Hypo-fractionation clinical trials currently underway will dramatically reduce the initial cost of proton treatment in the not-too-distant future.

So, is proton therapy for prostate cancer significantly more expensive than IMRT? Absolutely not! Initial cost may be higher, but total cost is similar or maybe even lower. And, in the near future, even the initial cost will be comparable to IMRT.

Myth #2 ...



Myth #3:

Proton therapy is no better than advanced forms of conventional photon (X-ray) radiation treatment, such as IMRT, IGRT, CyberKnife, TomoTherapy or RapidArc. And, there may be more rectal damage with proton.

The Physics

Let's start out with the physics of radiation therapy. Proton radiation and conventional photon (X-ray) radiation destroy cancer the exact same way: by stripping electrons orbiting around the nucleus of

atoms that are part of the molecules that make up the tissues in the body. This causes damage to the genetic material, or DNA of cancer cells ultimately causing their death or eliminating their ability to proliferate. Without healthy DNA the cancer cells can no longer function properly or repair themselves, leading to apoptosis—or programmed cell—death. So radiation—proton or photon—programs cancer cells to die. If you deliver enough radiation to the tumor, all the cancer cells will die.

Radiation to Healthy Tissue

All scientists, radiation oncologists, and urologists agree that the only safe dose of radiation to healthy tissue is a *zero* dose. They would also agree that the difference between protons and photons (X-rays), which are used in IMRT and other forms of external beam radiation therapy, is clear cut: X-rays radiate everything in their path on their way to the tumor and also on their way out of the body. X-rays don't stop doing damage until they run out of energy.

Protons, on the other hand, can be controlled in such a way that they release minimal energy on their way to a tumor and can be brought to a stop at the tumor site, thus releasing virtually no radiation beyond the tumor, and preserving healthy tissue outside of the target area. So, with photons (X-rays), such as in IMRT treatment, not only is the tumor damaged, so is much of the healthy tissue surrounding the tumor. With protons, almost all of the energy is deposited right at the tumor site. So with proton, healthy tissue is mostly spared.

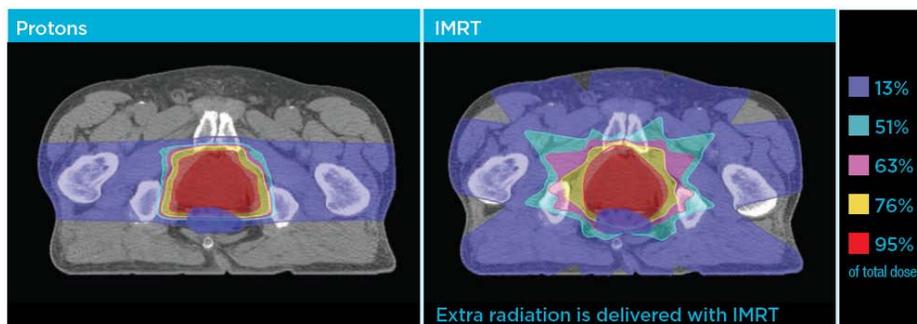
A Choice: Destroy the House or the Whole Neighborhood

In my book, I compare photon radiation (X-rays, IMRT) to military “carpet bombs,” which destroy whole neighborhoods, versus proton, which is like a computer guided “smart bomb” that just destroys the target, leaving the neighborhood intact.

Now consider where the prostate is located in the male anatomy, and what's in the “neighborhood.” The prostate is deep inside the lower torso. The urethra passes through it; the rectum is right next to it; the bladder is just above it, and the penis and testicles are also in the same “neighborhood.” Which would you prefer to attack cancer in the prostate, a “smart bomb” or a “carpet bomb?”

According to the Prostate Cancer Communication Newsletter, *PAACT Vol. 23 Number 1*, IMRT delivers three to five times more radiation to healthy tissue than proton.

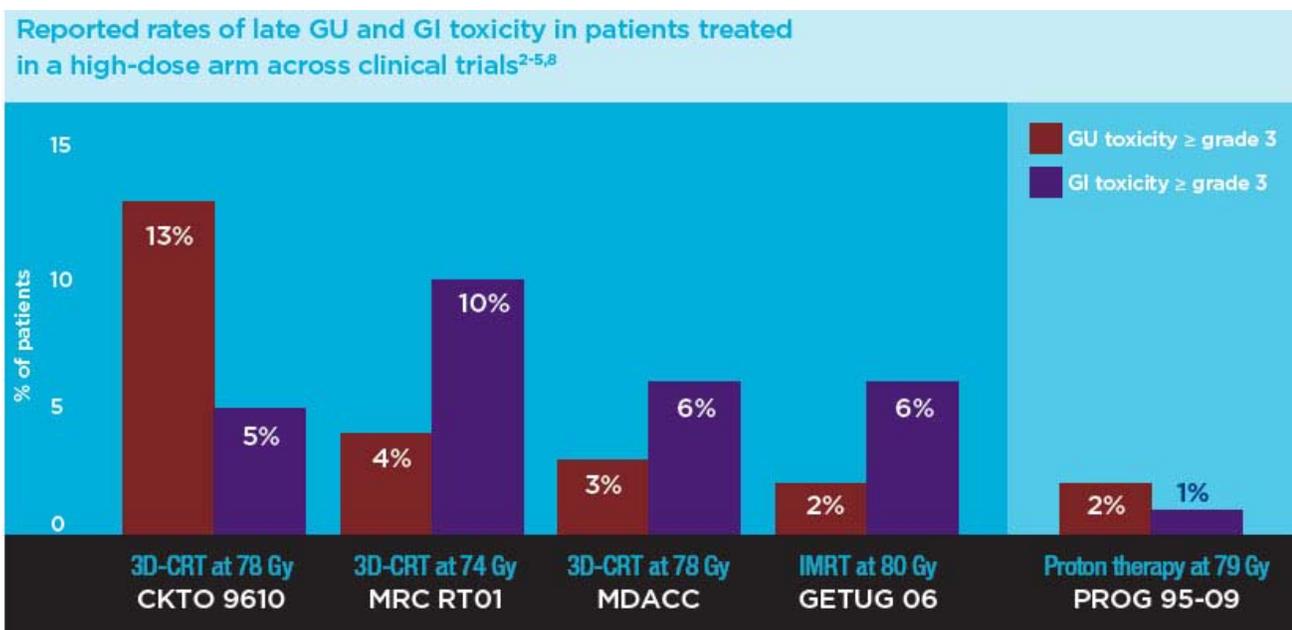
The image below shows the difference between proton therapy on the left, and IMRT on the right. As you can see, with IMRT the entire lower torso is radiated, and, brighter colors around the prostate target show high levels of radiation outside the target.



Higher Doses Better Outcomes—Maybe

Because protons spare surrounding healthy tissue, the dose can be increased without doing collateral damage. With IMRT, it's a balancing act, because in order to deliver higher doses of radiation to the tumor, you are also delivering higher radiation doses to healthy tissue. This increases the likelihood of side effects and secondary cancers later in life. We will be discussing this subject in more detail when we write about Myth #8.

The bar chart below shows the difference in genitourinary (GU) and gastrointestinal (GI) toxicity for conformal external beam radiation therapy (CRT), IMRT, and proton. Note that while the best form of X-ray therapy is comparable to proton with regard to GU toxicity, it shows six times the GI toxicity (6% vs. 1%).



Patient Reported Results Show Proton's Superiority

Our group, the Brotherhood of the Balloon, represents more than half the men alive today who have been treated with protons for prostate cancer. Two separate surveys of our membership have shown the superiority of proton therapy. When we discuss Myth #7 we will cover these surveys in some detail.

What About Cure Rates?

Numerous studies at several proton treatment centers have shown outstanding results. For low and intermediate risk patients, the disease-free survival rate with proton is in the range of 97 – 99% at five years and 93 – 94% at ten years. Patients with advanced disease had lower rates, but still comparable to, or better than, those of other modalities. More information on this will follow when we discuss Myth #7 in our April *BOB Tales*.

Why Not Randomized Clinical Trials (RCTs) Comparing Proton to IMRT?

Some insurers have denied coverage for proton therapy for prostate cancer because there have never been randomized clinical trials comparing the proton therapy to IMRT, which is cheaper. Remember, we disproved this myth last month by pointing out that initial cost may be higher, but long term costs for proton are likely comparable or lower. And even initial treatment costs will be comparable when the shorter treatment protocols are adopted sometime in the future.

But those who call for RCTs today are ignoring some important points including:

1. There are ethical issues involved in the patient selection process. Half the group will be intentionally given higher doses of radiation to healthy tissue. Physicians who understand the physics of proton therapy have difficulty participating in such a study.
2. An RCT program has been funded, but physicians/researchers are having a difficult time recruiting men to participate. Once the differences between proton and IMRT are explained to them, and they learn they may be randomly assigned to the treatment option that will deposit greater amounts of radiation to healthy tissue, they refuse to participate.
3. It will take five to ten years to fully understand disease free survival and morbidity (side effects) from the trial. By that time the lower-cost proton protocol will be standard practice and the cost debate will disappear.

One last point: There have never been randomized clinical trials comparing any prostate cancer treatment modalities. So, no one can say for sure how surgery compares with external beam radiation, or how seeds compare with IMRT, or how open surgery compares to da Vinci laparoscopic robotic surgery. And, if you really want to complicate things, bring in RapidArc, CyberKnife, TomoTherapy, HIFU, and other modalities. So why single out proton therapy?

Why Spend \$200 Million if IMRT is Just as Good?

When I was treated in 2000, there was only one proton center operating in the U.S., [Loma Linda University Medical Center](#). Today there are ten proton centers in the U.S. with 12 more under construction and nine more in the planning stage. Soon there will be 31 proton centers in the U.S. with many more around the world.

Would hospitals and investors be willing to spend close to \$200 million to build a proton center if proton was no better than IMRT?

Summary

The bottom line is this: During the past 22 years, thousands of prostate cancer patients have been treated with protons and numerous studies have been published showing high cure rates and minimal side effects. The laws of physics show, unequivocally, that proton is superior to IMRT and all other

forms of photon (X-ray) radiation because significantly less radiation is deposited on healthy tissue. The likelihood of secondary cancers with proton is essentially *zero*.

All the data, all the patient testimonials, and all the surveys show that proton therapy cures cancer at least as well as any of the alternatives; it's painless and non-invasive; and it leaves the patient with a higher quality of life than any of the other options. In our 2009 survey of BOB members, 97% of the respondents reported the quality of their lives after treatment was the same as or better than before treatment.

And finally, there are groups with names like, FloridaBOBs, ProtonPals, Brotherhood of the Balloon and others consisting of men who were treated with proton therapy for prostate cancer. The thousands of men in these groups are grateful for their treatment; and they spend their time promoting proton therapy in their communities. Where else can you find a prostate cancer treatment modality that has a fan club? You won't find a bunch of radical prostatectomy patients banding together to promote the benefits of surgery, or a group of IMRT guys or brachytherapy patients encouraging their friends and family to go the route they have chosen. There can only be one reason for this. Proton therapy is far superior, and those of us who have been fortunate enough to have received proton therapy know this, and we want to tell the world about it.

Myth #3 ...



Myth #4:

Proton therapy is not recommended for patients with a high Gleason score.

Over the years, we have received numerous phone calls and e-mails from men who were told by their urologists they were not candidates for proton therapy because their Gleason score was 8, 9, or 10. Next, they are often told that surgery is the best option for them. Nothing could be further from the truth, in our opinion.

If prostate cancer is contained within the capsule, we would argue that proton is the best treatment to choose. Why? Because proton therapy has been proven to destroy localized cancer and it leaves the patient with a higher quality of life after treatment. You may recall that in a recent survey, 97% of our members reported the quality of their lives after proton treatment was the same as or better than before treatment. No other prostate cancer treatment option can claim this—certainly not surgery.

But—and here is a very important “but”—what if the cancer is outside the prostate, and still localized within the prostate bed?

Cancer Left Behind With Surgery

It's not uncommon for prostate tissue to be left behind during surgery—both open and laparoscopic. **Dr. Charles Myers** talks about this in one of his [recent weekly videos](#). If this tissue happens to be cancerous, then the patient will have a recurrence.

But what about cancer in the margins? This is always a possibility, more so than most people think. If you [visit the Partin Tables on the Internet](#), and find your pre-treatment PSA and Gleason scores, you can determine the probability of cancer in the margins around your prostate. In Bob's case, at age 57 when diagnosed, with a PSA of 7.9, Gleason score of 3+3=6, and a clinical stage of T1c, the probability was 30.5% that there was cancer in the margins. For men with higher PSAs and higher Gleason scores, the probability increases dramatically. Let's say you are the same age, with a pretreatment PSA of 9.0, Gleason score of 4+4=8, and a staging of T2b. In this case, there's an 86% chance the cancer has spread outside the prostate.

Why is this important? There are many reasons. Cancer that spreads outside the prostate is not removed during surgery. Period! Typically this cancer is microscopic and cannot be seen with the naked eye, so surgeons cannot just remove it. So, the likelihood of cancer returning for Gleason 8, 9, or 10 patients after surgery is high.

Why is proton better? Because, when doctors treat with protons, they not only treat the prostate, the capsule and local seminal vesicles, they also treat a margin around the prostate. At Loma Linda where Bob was treated, they treat a 12 mm margin (about ½ inch). This is a huge benefit, in our opinion, because studies have shown that when cancer escapes the gland, it typically stays within a few millimeters of the capsule. This cancer in the margin is targeted and destroyed by proton radiation. The same can be said about other forms of radiation that target both the prostate and a margin around the prostate.

Bottom Line

Proton radiation, often used in conjunction with photon radiation and hormonal therapy for advanced, localized cancers (Gleason 8, 9, 10) has a much better chance of destroying all the cancer than does surgery.

Take a Look at BOB Membership

We have about 700 members of our group with a Gleason score of 8 and higher, about 200 of these are in the 9 or 10 category. A great many of these men were treated 10 or more years ago and the overwhelming majority of them are doing fine today.

How about our good friend, **Bob Reimer**? You may recall Bob's story from past newsletters. Bob was diagnosed with advanced prostate cancer, PSA 61, Gleason score 10. His local doctor told him to get his affairs in order because he probably had 18 months to live. Bob would have none of that. He did his homework, chose proton treatment at Loma Linda (in combination with photon and hormonal therapy), and today—more than 14 years later—Bob is doing fine.

Not everyone with aggressive cancers have this outcome. There is a higher percentage of recurrences at these levels, but nowhere near what they would be if surgery alone had been chosen.

We actually have a reference call list of BOB members with high pre-treatment Gleason scores. When someone contacts us with a high Gleason score and has been told by his local doctor he's not a candidate for proton treatment, we put them in touch with some of the men on this list and we encourage them to talk with several men with high Gleason scores who chose surgery or other treatment options ... if they can find them.

Myth #4 ...



NOTE: To determine the probability of cancer spreading outside the prostate, click here for the [Prostate Calculator](#), or take a look at the [Partin Coefficient Table](#).

Myth #5:

If you have surgery and it fails, you can always have proton afterward. But if you have proton first and it fails, you cannot have surgery.

One scare-tactic urologists often use to persuade their patients to do surgery is this: “If you have surgery and it fails, you can always have radiation later, but if you choose radiation, you’ll never be able to have surgery.”

The Facts

Yes, there are some recurrences with proton therapy, however very few and it's usually, but not always, the advanced cases and more aggressive cancers. But let's look at it carefully.

When there is a recurrence after proton therapy the first thing to do is consider the age of the patient and the velocity of the PSA increase, or doubling time. Recurrences that happen many years after treatment are often indolent, slow growing cancers that might never cause any problems.

If the PSA doubling time is long, the patient, with his doctor's support, may choose to do active surveillance, as he would likely die of something other than prostate cancer long before any symptoms would show up.

But let's assume this is not the case; the patient is relatively young, and the PSA velocity is of concern. The first thing doctors would do is to run a series of tests to determine the location of the recurrence.

Recurrence Outside the Prostate

If tests show the recurrence is outside the prostate, this means there apparently is no cancer within the prostate and therefore no reason to remove it. It also means that even if the prostate had been removed surgically, there would have been a recurrence.

When there is a recurrence outside the prostate, the most common treatment prescribed is hormonal therapy. There are several different hormones used, and each case is different. Hormones may be used individually or in combinations. They could be used continuously, or intermittently. Intermittent Hormonal Therapy (IHT) is becoming more common for treating prostate cancer that has recurred after any form of treatment. Many, if not most, respond well to this treatment for extended periods of time.

Recurrence Inside the Prostate

Once again, testing must be done to determine the location of the recurrence. If inside the prostate, the patient has several options, including cryotherapy, high intensity focused ultrasound (HIFU), brachytherapy, active surveillance, and ... salvage radical prostatectomy. Yes, surgery.

Salvage radical prostatectomy (SRP) is more challenging after any form of radiotherapy, but it can be done and has been done by doctors who specialize in this procedure.

Bottom Line

Don't choose your treatment on the basis of what to do if it fails. Choose the treatment that you believe gives you the best chance of a cure and the best quality of life after treatment.

All the data shows that proton therapy cures cancer at least as well as surgery, and we would argue better because proton destroys cancer in the margins and surgery does not.

We have heard on many occasions from recently diagnosed men, "My urologist tells me that the only way I can be sure of a cure is by having my prostate removed." Our response is, "That's interesting. Because when Bob Marckini was being treated almost 13 years ago, he met a lot of men who were having salvage proton therapy following failed surgery." Most likely, it was cancer in the margins that gained a foothold and continued growing.

Why would anyone choose a treatment that has the potential of complications from anesthesia, infection, trauma, blood loss, catheterization for two to three weeks, slow recovery, and high incidence of impotence and incontinence ... when you can choose an alternative that involves no invasive procedure, no pain, no blood loss, no trauma, and significantly fewer side effects, if any? Seems like a no-brainer.

So, next time you hear someone say that you can have radiation after surgery, but you can't have surgery after radiation, be sure to tell them they are misinformed.

Myth #5 ...



Myth #6:

My doctor tells me that the only way to be sure I'm cured is to have the prostate removed from my body. With proton therapy, the prostate is left behind, so my chance of a recurrence is higher.

This is one we hear quite often. Many people are of the mistaken belief that it's true, having the prostate removed guarantees a cure. And it would be true if 1) you were 100% sure the cancer was confined to the prostate and, 2) if the surgeon did not leave behind any part of the prostate.

But the fact is, in a large number of cases, the cancer has escaped the prostate into the tissue surrounding the prostate. This escape of cancer is almost always microscopic and thus cannot be seen by the surgeon, causing cancer to be left behind. Also, it is not uncommon for part of the prostate to be left behind following surgery, especially with the nerve sparing technique. If this tissue contains cancer cells, then again, you still have cancer.

Even with early stage, "garden variety" prostate cancer, there is good chance there are microscopic cancer cells in the tissue surrounding the prostate. These cancer cells left behind after surgery are the seeds for the re-growth of the cancer.

Two Examples

Let's say your PSA is 5.2, your Gleason score is 3+3=6, and your stage is T1c. The Partin tables show that there's a 67% chance your cancer is organ confined. This means there's a 33% chance there is cancer in the tissue surrounding your prostate. The tables also show there is a 3% chance of seminal vesicle involvement. Surgery doesn't remove the tissue surrounding the prostate and usually not the seminal vesicles.

Now, let's assume your PSA is the same, 5.2, but your Gleason score is 7 and your staging is T2b. In this case, the Partin tables show a 25% chance of organ confined disease (75% chance of cancer in the tissue surrounding the prostate), and an 18% chance of cancer in the seminal vesicles.

One significant advantage of proton therapy is that the tissue surrounding your prostate is treated as well as the seminal vesicles. So, in our opinion, the chance of destroying all the cancer is greater with proton therapy than with surgery.

One Last Point

When Bob was in treatment almost 13 years ago, about 5% of the patients being treated at Loma Linda were men who had previously had their prostates removed surgically. About 350 members of our group (5.4%) had surgery to remove their prostates. They were not cured because cancer was left behind after surgery, and they chose proton for salvage treatment. So, clearly, having the prostate removed surgically does not guarantee a cure.

We believe your chances of a cure are better with proton therapy because it is designed to eradicate cancer cells where they are found: In the prostate, seminal vesicles, and tissue surrounding the prostate.

Add to that the fact that proton therapy is painless, non-invasive, carries no risk from infection or anesthesia, does not require a catheter, and generally leaves the patient with a better quality of life after treatment ... and the treatment decision becomes quite easy.

Myth #6 ...



Myth #7:

There are no studies or documentation that support the success or superiority of proton therapy for prostate cancer.

We often hear from recently diagnosed men that their urologist is pressuring them to have surgery. When they bring up the subject of proton, they are often told some of the stories we have already addressed in Myths 1 through 6, such as “Proton therapy is ‘experimental’ or ‘investigational,’” or “it’s no better than advanced forms of conventional radiation.” Another story they are often told is that there are no published studies, documentation, or articles on proton therapy for prostate cancer showing the benefits, or no statistics to back-up claims of proton’s superiority. This is not true.

Over the past 23 years there have been dozens of studies and articles on this subject. One such (very recent) study is reported on page five of this newsletter on proton therapy and potency. Space doesn’t permit us to list all of the articles and studies. A partial list is on the following page.

What do these studies, surveys, and articles tell us? They tell us that:

1. Proton therapy is the most precise form of radiotherapy available today.
2. Two to three times less radiation is deposited on healthy tissue with proton than with any form of photon (X-ray) radiation.
3. Higher doses of radiation do a better job of killing cancer, and, contrary to experience with conventional x-ray radiation, when proton doses are increased there is no corresponding increase in collateral damage and side effects.
4. Cure rates with proton therapy are at least as good as surgery or conventional radiation.
5. Genitourinary and gastrointestinal complications are lower with proton therapy than with other treatment modalities.
6. Sexual function is better preserved with proton therapy.

7. Proton therapy is an excellent treatment choice for young men with prostate cancer.

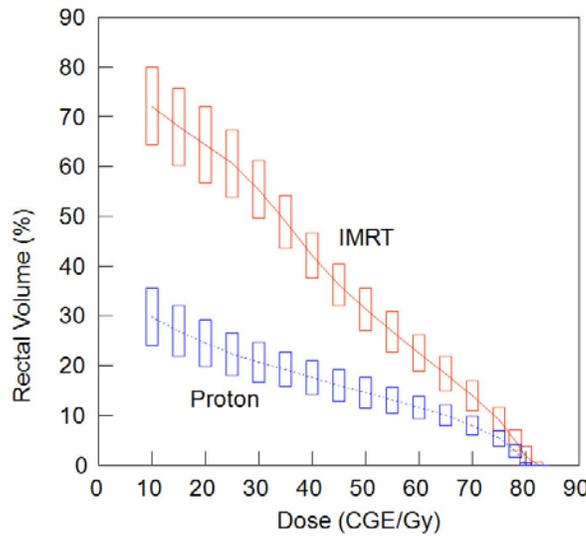
Here is a sampling of some of the studies, articles, and surveys relating to proton therapy for prostate cancer:

- **Ten Year Study: Proton Therapy for Prostate Cancer: The Initial Loma Linda University Experience.** *Int. J. Radiation Oncology Biol. Phys.* Vol 59, No. 2, pp, 348-352, 2004. Jerry F. Slater, M.D., et. al.
- **Fifteen Year Report: Clinical Applications of Proton Radiation Treatment at Loma Linda University: Review of Fifteen-year Experience.** *Technology in Cancer Research and Treatment* ISSN 1533-0346, Vol. 5, No. 2, April 2006. Jerry D. Slater, M.D.
- **Randomized Trial Comparing Conventional-Dose With High-Dose Conformal Radiation Therapy in Early-Stage Adenocarcinoma of the Prostate: Long-Term Results From Proton Radiation Oncology Group/American College of Radiology 95-09.** *J Clin Oncol* 28.2010, American Society of Clinical Oncology. Anthony L. Zietman, M.D. et. al.
- **Conformal Proton Beam Radiation Therapy of Prostate Cancer.** *Prostate Cancer Communication Newsletter.* Vol 23 No 1, March 2007. Carl J. Rossi Jr. M.D.
- **Urinary functional outcomes and toxicity five years after proton therapy for low- and intermediate-risk prostate cancer: Results of two prospective trials.** *Acta Oncol.* 2013; April; 52(3):463-469. Randal H. Henderson, et. al
- **Early Outcomes From Three Prospective Trials Of Image-Guided Proton Therapy For Prostate Cancer.** *Int. J. Radiation Oncology Biol. Phys.,* 2010. Nancy P. Mendenhall, MD et. al.
- **Proton-beam Rx reduces prostate cancer recurrence.** *Oncology NEWS International.* Vol. 19 No. 1
- **Clinical evidence demonstrates good disease control with minimal early adverse events.** By Ed Susman | January 20, 2010
- **Study: Majority of Men Report Being Sexually Active After Proton Therapy for Prostate Cancer.** *WebMD Health News* Nov. 5, 2010
- **Proton Therapy for Prostate Cancer.** *Oncology.* June 2011. Bradford Hoppe, M.D. MPH, et. al
- **Proton-beam Rx Reduces Prostate Cancer Recurrence. Clinical Evidence Demonstrates Good Disease Control With Minimal Early Adverse Events.** *Oncology News International,* Vol. 19 No. 1. January 2010
- **Proton Beam Therapy Affects Less Healthy Tissue Than Standard Radiation.** *Medical Edge Newspaper.* Mayo Clinic. January 27, 2012
- **Hypofractionated passively scattered proton radiotherapy for low- and intermediate-risk prostate cancer is not associated with post-treatment testosterone suppression.** *Acta Oncol* 52(3):492-7 (2013) PMID 23477360
- **A Phase II Study of Hypofractionated Proton Therapy for Prostate Cancer.** *Acta Oncol* (2013) PMID 23398594. Yeon-Joo Kim, et. al.
- **Outcomes in Men with Large Prostates (>60 cc) Treated with Definitive Proton Therapy for Prostate Cancer.** *Acta Oncol* (2012) PMID 23244673. Lisa McGee, et. al
- **Erectile Function, Incontinence, and Other Quality of Life Outcomes Following Proton Therapy for Prostate Cancer in Men 60 Years Old and Younger.** *Cancer.* September 15, 2012. Bradford S. Hoppe, MD MPH, et. al.
- **2009 Survey of Brotherhood of the Balloon Membership Reports 94% Cure Rates and Minimal Side Effects.** The BOB represents more than half the men who have been treated with proton therapy for prostate cancer.
- **Second Survey of Brotherhood of the Balloon Membership Using Standardized EPIC Survey Tool Confirms Results of 2009 Survey.** Reported at ASTRO and NAPT.

Rectal Sparing

The graph on the right, titled “Rectal Sparing,” shows considerably higher doses of radiation to the rectum with IMRT vs. proton.

The chart below on the right, titled “Dose Escalation Trials Support the Use of Protons for Prostate Cancer,” shows better disease control with proton and significantly lower GI (gastrointestinal) toxicity with proton vs. IMRT.



RECTUM

Relative Mean Rectum Dose Savings: 59.2%

Absolute Mean Rectum Dose Savings: 20.1%

Vargas et al
IJROBP 2008

Are More Studies Really Needed?

Dr. James Cox, a prominent researcher from MD Anderson commented on this subject in an [article in the *Journal of Clinical Oncology*](#). In the article he pointed out the fact that there is considerable documented evidence that with protons, there is two to three times less radiation deposited on healthy tissue; radiation delivered to normal tissue causes damage to this tissue, and the severity of damage increases with increasing dose.

Dose Escalation Trials Support the Use of Protons for Prostate Cancer

Protons allow for increased dose which leads to increased biochemical control without increased toxicity

RCT	Boost Modality	Planning Technique	LD arm	HD arm	HD 5-yr control	≥G3 GI toxicity	
						LD	HD
MD Anderson	X-rays	2-D, 3-D	70.0	78.0	75%	1%	7%
CKVO96-10 (Dutch)	X-rays	3-D, IMRT	68.0	78.0	64%	4%	6%(NS)
MRC RT01 (UK)	X-rays	3-D	64.0	74.0	71%	3%	10%
GETUG 06 (French)	X-rays	3-D	70.0	80.0	72%	2%	6%
PROG 95-09 (MGH – Loma Linda)	Protons	3-D	70.2	79.2	91%	1%	1%

Protons – Improved biochemical control WITHOUT increased toxicity

He states that, “We doubt that many of us, while healthy, would agree to receive, for example, 25 Gy to a large fraction of our brain or abdomen in exchange for some thousands of dollars, with no known or credibly hypothesized medical benefit. If we would not, how can we ask our sick patients to do so? Once proton beam therapy has become clinically available, is not the burden of proof on conventional x-ray therapy? Should not its advocates have to demonstrate that the cost savings achieved by using x-rays are not accompanied by undesirable additional morbidity? Do the users of x-ray therapy have the evidence to support such a claim?”

Myth #7 ...



Myth #8:

Proton is radiation, and that means I am at risk for secondary cancer from proton treatment later in life, just as I am with IMRT.

It's Ubiquitous!

The fact is, radiation is everywhere in the cosmos. It's in the air, the soil, some foods, water, and sunlight. Our own bodies —muscles, bones, and tissue—contain naturally occurring radioactive elements.

Small amounts of radiation can come from medical X-rays, airport scanners, police speed monitors, radio waves, cell phones, solar flares, and there is even some lingering trace radiation from A-bomb tests of the 1940s and '50s.

Eighty-two percent of the radiation we are exposed to comes from natural sources, and the most significant natural source is radon gas from the earth. Most of the remaining 18% is from medical diagnosis and treatments, with less than 1% coming from nuclear power and fallout.

Latitude and Altitude Matter

Naturally occurring radiation is stronger at the poles and weaker at the equator according to studies. But even more of a factor is altitude. Cosmic radiation increases with altitude. People who live in Denver at 1,600 m (1 mile) receive nearly twice the dose than those who live at sea level. People who live in Leadville, Colorado at 3,200 m (2 miles) receive more than four times the annual sea level dose of cosmic rays.

We have lots of airline pilots in our group. Some have speculated that the thousands of hours they have spent flying may have contributed to their prostate cancer diagnosis. No studies have ever confirmed this to our knowledge.

The Good and Bad of Radiation

We know that radiation exposure can be harmful. And we also know that radiation can be beneficial. It can destroy cancer (curative) and relieve pain (palliative).

There is one thing about which radiation oncologists, scientists, and physicists agree: The only safe dose of radiation to healthy tissue is a zero dose. So, using radiation in medicine is a double edged sword. Send it to the target and it does its job. Send it to healthy tissue and you run the risk of collateral damage, including the possibility of causing secondary cancers.

The Beauty of Proton

Because of the special characteristics of the proton particle (the Bragg Peak), it can be sent deep inside the body, releasing minimal energy on the way in, and then depositing all remaining energy at the target volume. There is essentially a zero dose beyond the target, or tumor.

X-rays, or photons, which are used in essentially all other forms of radiation treatment (IMRT, CyberKnife, TomoTherapy, RapidArc, etc.), deposit radiation on everything in their path—both on the way to the target, and on the way out of the body. With proton, most of the radiation is deposited on the target volume. With X-rays (photons), most of the radiation is deposited on healthy tissue. It's that simple.

Protons Clearly Superior

Studies have shown that two to three times less radiation is deposited on healthy tissue with protons than with X-rays. That being the case, the likelihood of secondary cancers is considerably lower with protons than with X-rays. This was confirmed in a study titled, [Comparative Analysis of Second Malignancy Risk in Patients Treated with Proton Therapy versus Conventional Photon Therapy](#), and was presented September 2008 at the American Society for Therapeutic Radiology and Oncology (ASTRO) in Boston.

No Secondary Malignancies with Protons

In a letter to the *Wall Street Journal*, **Dr. Andrew Lee**, from MD Anderson, said,

We've also published an analysis comparing IMRT vs. Protons in prostate cancer and the potential impact on 2nd radiation-associated malignancies. We found that proton therapy may decrease the rates of 2nd radiogenic cancers by up to 30-40% compared to IMRT. (Fontenot et. al. IJROBP 2009)

This is corroborated by the clinical experience at Mass General: When they reviewed their 2nd cancer rates with protons, it was significantly lower than the national average with X-rays, and interestingly, the patients who received proton therapy alone (not mixed x-rays and protons) had no 2nd malignancies.

(Emphasis added)

Bottom Line

Is a secondary cancer possible several years after proton therapy? Theoretically, yes. But, the likelihood is significantly lower than with any other form of radiotherapy. In fact, we have not seen a single case of secondary cancer from protons within our group of 6,400 members, which represents more than half the men in the world who have been treated with protons for prostate cancer.

Myth #8 ...



Myth #9:

If protons were so good, than [fill in name of prestigious institution] would have a proton center.

This is absolutely true. If proton therapy is as good as we say it is then the most prestigious medical institutions in the world, like Mayo Clinic, Johns Hopkins, Memorial Sloan Kettering, MD Anderson, and others would have them.

But wait ... they do! Or they soon will.

Only One Center When Bob Was Treated

When **Bob Marckini** was treated in 2000, there was only one proton center in the United States. Loma Linda University Medical Center took a huge risk investing tens of millions of dollars in a technology that had never been tried in a hospital setting. Particle accelerators existed, but they were city blocks in size, and none of the supporting equipment and systems had been invented: Imaging, beam delivery, beam focusing, treatment gantries, etc. All this had to be designed and built from scratch. The rest, of course is history. The first proton treatment center, LLUMC, opened in 1990, and since then, ten more have been constructed in the U.S. with 19 more in the construction or development stage, and there are several more in Europe and Asia. More than 90,000 patients have been treated with protons.

You Can't Argue With the Laws of Nature

The laws of physics cannot be refuted. Proton particles destroy cancer using the same mechanism as X-rays, but that's where the similarity ends. With X-rays, most of the radiation is deposited on healthy tissue. With protons, it's just the opposite. Three times less radiation is deposited on healthy tissues with proton therapy.

If all this is true, then why aren't there proton treatment centers in all hospital? The answer is *cost*. The cost to build a proton center today is \$150 to \$200 million. And the cost to operate a proton center is also high. Not too many hospitals can afford this, and few hospital boards are willing to approve expenditures at that level. But this is changing.

Some medical centers that are operating with older radiation technologies criticize proton therapy on the basis that it costs more, but has never been "proven" to be superior to conventional radiation techniques when treating prostate cancer. They claim that randomized clinical trials have never been conducted to prove the superiority of protons.

Yet these same centers acknowledge the superiority of using protons for treating brain tumors, spinal tumors, ocular tumors, and pediatric cancers, because of the significant benefits resulting from spared healthy tissue around the target volume. Interestingly, there have never been randomized clinical trials to prove this. The laws of physics are irrefutable.

Top 10 Cancer Centers Are Embracing Proton Therapy

We wrote an article in our [March BOB Tales](#) titled, “Top Ten Cancer Centers Moving Toward Proton.” In the article we referenced the annual U.S. News & World Report ranking of the top cancer hospitals in the United States. Interestingly, seven of the top ten cancer centers either have a proton center or are building one. There’s a message there.

Today there are 11 operating proton centers in the U.S. with 19 more in the planning or construction stages. Two are even planned for the Washington, DC area. Many more are operating in Europe and Asia.

Considerable research is underway to reduce the capital investment to build a proton center, and important clinical trials are underway at several proton centers to dramatically reduce the cost of treatment.

So, pick the name of a prestigious medical center. They probably already have a proton center. If not, you can bet they are planning to build one.

Myth #9 ...



Myth #10:

I can't afford to take the time away from work and family required for proton therapy. I can get my treatment locally in a much shorter time and expect the same results.

This is partially true. You can get alternative treatments closer to home; it’s more convenient; and you MAY get the same results, but not necessarily.

The best way to respond to this myth is to encourage you to [read myths 1 through 9](#). By doing so, you’ll learn that prostate cancer treatment options are all very different; that surgery often leaves the patient with lifelong debilitating side effects; that while some treatments like seeds and HIFU are quick, they aren’t necessarily as effective as proton, and quality of life may be compromised. In addition, conventional radiotherapy options, like IMRT, deposit two to three times more radiation on healthy tissue. Reviewing the first nine myths will also show that:



Proton therapy is an FDA approved treatment with a long track record of curing prostate cancer.



The laws of physics prove that it is superior to all other forms of radiotherapy because most of the radiation is deposited right at the tumor volume, and not on healthy tissue.



Even with early stage disease, there can be cancer in the margins which is missed by surgery, but not by proton therapy.



The chance of secondary cancers later in life are lowest with proton therapy than any other form of radiotherapy, and for proton-only patients, the likelihood of secondary cancer is zero according to one study.



Surveys of the BOB group—which represents more than half the men alive today who have had proton therapy for prostate cancer—shows the overwhelming superiority of protons:

- 99% claim they made the best treatment decision for themselves
- 96% were satisfied or extremely satisfied with their results
- 92% report their quality of life is same as or better than before treatment
- Those who received proton-only treatment had similar urinary, bowel, and hormonal scores as healthy men who never received any form of prostate cancer treatment
- 96% reported their prostate cancer was in remission



Men with advanced localized disease (high Gleason scores) have excellent results when proton therapy is combined with photon radiation and hormonal therapy.



There are literally dozens of studies and articles that attest to the superiority of proton therapy.



Despite the high capital cost, most of the major cancer treatment centers have invested in proton treatment or are planning to build one.

Does this mean having proton therapy is worth the inconvenience of being away from home or work for several weeks? We certainly think so.

We occasionally hear from businessmen, often small business owners, who say, “I just can’t afford to be away for two months.” We typically ask them, “What would happen if you got hit by a bus and were out of commission for two months? Would your business survive?” The answer is almost always, “Yes.” Then we say, “So why not do yourself a favor and choose the best treatment in the world for your prostate cancer?”

Two months away from home may seem like a long time, but it’s a speck of time in the grand scheme of things. And, when the quality of the rest of your life is at stake, a two-month sabbatical

could be an excellent “investment” in time to give yourself the best chance of a cure and quality of life after treatment. For most of us, the two months go by in a flash—and believe it or not—many of us are sad when the treatment ends.

Myth #10 ...



Bonus Myth:

My urologist tells me I’m not a good candidate for proton therapy because I’m a young guy and that young men should have their prostate taken out surgically.

Lots of young men are being pressured to choose surgery because, they are told, they have many years to live, that radiotherapy of all types is only a temporary cure, and that their cancer will probably return ... unless they have their prostate removed surgically.

If all the cancer is contained within the prostate and the prostate is removed, that statement is partly true—the cancer cannot return. But we’ve shown in our Mythbuster Series there is often cancer in the margins, the tissue around the prostate that is not removed by surgery.

Even Early Stage Cancer Can Escape the Prostate

According to the [Partin tables](#), a patient with a PSA less than 10, a Gleason score 6, and stage T1c has a 67% chance of organ confined disease. That means there’s a 33% chance of cancer in the tissue surrounding the prostate. The tables also show that a Gleason 7, T2b patient has a 22% chance of organ confined disease (78% chance of cancer in the margins).

Also, there have been documented cases where surgeons have, in fact, left prostate tissue behind during radical prostatectomy. If there is cancer in the margins or if cancerous prostate tissue is left behind, cancer will likely return. So, why not choose a treatment that will target cancer within the prostate as well as cancer in the margins? That’s proton therapy.

If Best for Children, Why Not Young Men?

All radiation oncologists seem to agree that the patients who benefit most from proton therapy are infants and young children. Why? Because proton therapy has been proven to both destroy cancer and protect surrounding healthy tissue. In a child, protecting surrounding organs, bones, and tissue is crucial, because when these healthy areas are damaged by radiation, that part of the body often stops growing. If the pediatric tumor is in the shoulder, arm, or leg, there’s a good chance that limb will not

develop with the rest of the body. Also, because healthy tissue is not targeted, the likelihood of secondary cancers later in life is significantly diminished.

So, if proton is best for destroying cancer and preserving the quality of life in infants and young children, why wouldn't it be best for destroying cancers and preserving quality of life in young men?

Young Men Are Better Educated Today

More and more young men are choosing proton therapy for their prostate cancer because they are better educated today than ever before. They know their chances of losing sexual function and having to wear a diaper for the rest of their lives is far greater with the surgical option than with any form of radiation therapy. If they've done their homework, they've learned that of all the radiotherapy options, proton is best because it targets the tumor and preserves healthy organs and tissue surrounding the prostate. And when that healthy tissue includes the rectum, bladder, and nerves for sexual function, it becomes even more important to a young man.

Clinical Study on Younger Men Showed Satisfaction with Quality of Life after Proton Therapy

In 2011, the University of Florida Proton Therapy Center reported on a clinical study involving 98 men with low, intermediate, and high-risk prostate cancer who were 55 years-old or younger when treated. These men were evaluated pre-treatment and post-treatment at six month intervals. After 18 months the study showed:

- 21 percent experienced mild urinary side effects that were treated with prescription medication.
- 3 percent experienced mild gastrointestinal side effects that were treated with prescription medication.
- No patients experienced permanent incontinence.
- No patients experienced significant rectal side effects.
- 94 percent of those that did not receive androgen deprivation therapy were sexually active.
- Only 2 patients were dissatisfied with their treatment decision.

Bottom line, according to the report, "Young men treated with proton therapy for prostate cancer have few significant side effects in the first 18 months after treatment." The results were reported at the 52nd annual meeting of the American Society for Radiation Oncology.

Going to the Source—Young BOB Members

The Brotherhood of the Balloon consists of close to 800 members who were 55 or younger when treated. And we have more than 150 members who are in their 30s and 40s.

Many of our youngest members were treated within the past five years, but several go much further back, including one treated 15 years ago and another treated 21 years ago.

Last month we conducted a random “mini-survey” of the youngest in our group and asked questions about PSA, sexual function, urinary function, bowel function, and how they felt about their proton treatment decision.

Everyone who responded gave permission to use their names, and most offered to speak with any young men who are considering proton therapy.

The responses were surprisingly consistent:

- PSA was either down to nadir or still dropping.
- No change in urinary function
- No change in bowel function (one reported some minor rectal bleeding)
- Sexual function not changed at all, or has slightly changed, but not a problem (one respondent said, “Sexual function is better than before treatment, probably due to finding the love of my life after treatment.” Another stated, “I am not as ‘strong’ as before, and sometimes I use the ‘blue gold.’”)

Other comments from the young guys in our survey:

- “I tell the guys that contact me that I know how they are feeling. I remember lying in bed next to my sleeping wife awake with my gut in knots. But with knowledge comes peace. So, with surviving being the number one goal, the next question is—what kind of life does one want after treatment? Normal sex or not? Diapers or no diapers? Bowel problems or not? Infections or no infections? And on and on ... For my wife and me it was an easy decision and one that we have not regretted!”
- “I was concerned how treatment might impact my mild colitis. I have experienced zero bowel irregularity with the exception of mild tenderness one week during treatment.”
- “I absolutely made the right decision. I frankly do not understand why anybody would choose any other treatment.”

- “I feel fantastic about the decision to choose proton as a therapy. It’s really provided a fantastic QOL compared to what I read about alternative treatments.”
- “My feelings concerning having had proton treatment is one of being grateful—grateful for having lived at a time when the technology and the vision of **Dr. James Slater** were brought together so that I could benefit from the proton beam.”
- “Bob’s book and website have truly helped me in my cancer journey. The monthly newsletter is both inspirational and informative and I enjoy the completeness of the coverage and stories. I’m happy to support the message of proton therapy and welcome the opportunity to help new members.”
- “Proton was the best decision of my life and it changed my way of living totally. I now have a much better and healthier way of living.”
- “When you are 42 years old, as I was five years ago when I went to Loma Linda, you have to make a decision for, hopefully, the next 40 years. I would not like to spend this time dealing with incontinence or impotence (I love my wife too much). I can think of no better investment in the next 40-50 years of my life.”

And how about this comment ...

- “I actually fathered a child after my treatment—a healthy son, born August 2010.”

While this was a small sampling of our younger members, the responses are consistent with what we have been hearing from them in our regular communications and with the study mentioned above.

So, is proton therapy just for older men? Clearly, the answer is *no*.

Bonus Myth ...

