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Super Pulsed Dental Lasers

A Peer-Reviewed Publication
Written by Dr. Ian Shuman

Abstract

There are many methods available to perform minor oral soft tissue surgery and procedures. Those that provide a minimally invasive methodology with rapid healing are ideal and are today's gold standard in all aspects of dental care. The dental laser is a device that meets these goals and should be considered in the treatment of cases when weighed against other options. This course will provide information on dental lasers, specifically the newer class of super pulsed diode lasers.

Educational Objectives

The focus of this clinical study will offer the dental professional the information needed to improve patient care with the use of diode power lasers. After reading this article, the reader should be able to:

1. Understand the history of dental lasers
2. Have a working knowledge of the dental laser and its use in soft tissue surgery
3. Identify the differences between traditional diode lasers and super-pulsed lasers
4. Select the correct laser and settings for proper care

Author Profile

Ian Shuman DDS, MAGD, AFAAID maintains a full-time general, reconstructive, and aesthetic dental practice in Pasadena, Maryland. Since 1995 Dr. Shuman has lectured and published on advanced, minimally invasive techniques. He has taught these procedures to thousands of dentists and developed many of the methods. Dr. Shuman has published numerous articles on topics including adhesive resin dentistry, minimally invasive restorative, cosmetic and implant dentistry. He is a Master of the Academy of General Dentistry, an Associate Fellow of the American Academy of Implant Dentistry, a Fellow of the Pierre Fauchard Academy. Dr. Shuman was named one of the Top Clinicians in Continuing Education since 2005, by *Dentistry Today*.

Author Disclosure

Dr. Shuman has no commercial ties with the sponsors or the providers of the unrestricted educational grant for this course.

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Abstract

There are many methods available to perform minor oral soft tissue surgery and procedures. Those that provide a minimally invasive methodology with rapid healing are ideal and are today's gold standard in all aspects of dental care. The dental laser is a device that meets these goals and should be considered in the treatment of cases when weighed against other options. This course will provide information on dental lasers, specifically the newer class of super pulsed diode lasers.

Introduction

Dental lasers have been used for direct intra/extraoral minimally invasive care and there is a ubiquitous sense that they are non-threatening. In a survey of a patient population on their perception of lasers, 69% thought that their dental visits would be made easier. In addition, lasers provide post-operative comfort, and rapid healing. This course will focus on the use of diode lasers and dual wavelength diode lasers to achieve these objectives.

History

The first working laser, created by Theodore H. Maiman in 1960 used a "high-power flash lamp on a ruby rod with silver-coated surfaces".

The first diode laser was introduced in 1962 by Robert N. Hall, and functioned at 850 nm using gallium arsenide.

Stern and Sognnaes published their preliminary report, demonstrating the ability of a "ruby laser (that) could vaporize enamel".

Since then, various lasers have been produced that use a variety of materials to produce a specific wavelength and thereby, a specific mode of action. Some of these include carbon dioxide (CO₂), neodymium: yttrium aluminum garnet (Nd:YAG), and diode, for many dental applications.

Mechanism of Action

Lasers function by using a precise, color of a specific wavelength. When the laser beam light is collimated, or narrowly focused, it is able to stay narrow over long distances, and coherent or synchronized in phase, providing intense focus. Lasers can be selected based on their mode of action on specific tissue

types. Hard tissue lasers treat bone and tooth and other hard tissue structures while soft tissue lasers treat soft tissue structures.

The Diode Laser

While there are many lasers available to perform *soft tissue* surgery, (i.e. CO₂, Er-YAG) some of the more cost effective models are of the diode type. A diode laser for oral soft tissue surgery most commonly operates in the infrared spectrum with wavelengths between 810-980nm. Diode lasers in this range are well absorbed by chromophores present in tissues such as the oral mucosa and gingiva. In addition, all soft tissue diode lasers will provide the ability to operate on soft tissues; however, varying wavelengths offer different cutting abilities. The 810nm wavelength offers superior coagulation and is ideal for larger areas requiring surgery and sites involving more vascularized tissue. The 980nm wavelength is selected for finer tissue sites providing better ablation, and is preferred in areas where the tissue is less vascularized. There are a variety of dental lasers in this category including SIROLaser Advance Dentsply Sirona, Picasso Lite AMD, epic 10 Biolase, and the Precise SHP CAO Group Inc., among others. (Figure 1: a, b, c, d)



Figure 1: a b c d

Super-Pulsed Lasers

What makes the class of super pulsed lasers truly unique is peak power. Unlike traditional diode lasers, the average power of super-pulsed lasers can be up to 7-10 times greater. There are several super pulsed lasers currently available including the Gemini, (Ultradent (South Jordan, UT) (Figure 2) Epic Pro™ Diode Laser (Biolase, Irvine, CA), and the SIROLaser dental laser (Dentsply Sirona, York, PA). (Figure 3a,b) In devices such as the Gemini, the super-pulsed technology and 20 watts of peak power allows for thermal relaxation between the pulses and provides a smooth cut with less drag and charring than seen with a continuous wave laser. When the two diodes (810 and 980), each with the capacity of 10watts of power, are activated simultaneously, 20watts of peak power are achieved.



Figure 2



Figure 3a



Figure 3b

Chromophores

According to the ADA Standards Committee on Dental Products Working Group on Dental Lasers, the mechanism of laser surgery works by selectively affecting chromophores. A chromophore is the part of the molecule responsible for its color, and absorbs specific wavelengths of light. The chromophores the 810nm diode laser targets are hemoglobin and melanin, while the 970-980nm diode laser target is water. This makes it selectively effective when performing surgery on oral soft tissue, that by its nature contain high amounts of melanin and hemoglobin. It is this very specific mechanism of action that allows the diode laser to be used safely when in direct contact with structures that do not contain these chromophores such as restorations and dental implants.

Surgerizing the tissue occurs when the chromophores absorb their specific wavelength (in this case 810nm) and through the photo thermal system of the laser is vaporized. This causes a variety of positive effects during surgery and the minimization and even elimination of common post-surgical problems.

In any laser surgery there are immediate or primary effects such as bleeding, swelling and thermal tissue damage and there are post operative or secondary effects such as pain, infection, and wound healing. The following information will now review these issues and their effects caused by laser-mediated surgery.

Laser Benefits: Hemostasis and Inflammation

A laser created wound will greatly shorten the first phase of the wound healing response: bleeding and coagulation. This is due to the hemostatic effects of diode lasers, which are well documented. ,

Because of immediate hemostasis there is a significant decrease in post-bleeding vasoconstriction and vasodilation that is typically mediated by histamine, prostaglandins, kinins and leukotrienes. By greatly reducing or eliminating the hemostatic stage, working in a dry field is enhanced and inflammation is markedly reduced. This involves a clean, precise cut, gentle handling of the tissue and the avoidance of tissue edge necrosis. Also, hemostasis provides good visualization, and reduces hematoma formation.

Reduced Pain

The cauterization/ablation of exposed nerve fibers helps to greatly reduce post-operative discomfort. The use of an 810nm diode laser provides additional benefits to surgery in terms of less edema and postoperative pain.

Bactericidal Effect

The bactericidal effect of the diode laser reduces or eliminates the risk of infection. This beneficial effect is not only ideal for surgery, but also in the management of periodontal disease. Research has shown that mechanical methods of periodontal therapy alone may fail to eliminate the tissue-invasive pathogenic flora.

Therefore, considerable attention has been given to adjunctive antimicrobial measures. As noted, a study by Gokhale et al was conducted to evaluate the efficacy of the diode laser as an adjunct to mechanical debridement in periodontal flap surgery, on the basis of clinical parameters and microbiological analysis. Here, A total of 30 patients with generalized chronic periodontitis with probing depth >5 mm after phase I therapy were included in the study. Diode laser was used as an adjunct to open flap debridement (test) as compared with conventional flap surgery (control) in a split-mouth study design.

The study concluded that the diode laser was well tolerated by the patients, and the bactericidal effect of the diode laser was clearly evident by greater reduction of bacterial colony forming units of obligate anaerobes in the test group than in the control group.

Zone of Necrosis

Because the inherent properties of the diode laser during surgery are to essentially “damage” tissue albeit through careful management, there is the issue of collateral damage to adjacent tissue. When this collateral damage is not managed properly through the proper use of the lasers output through working modes, (i.e. power settings) the adjacent tissue can be irreversibly damaged. This area of damage is known as the zone of necrosis. (Figure 4a) Reducing collateral thermal damage from diode laser incisions is clinically relevant for promoting wound healing. (Figure 4b) Therefore, setting the laser parameters in accordance with the absorption characteristics of the tissue will reduce collateral thermal tissue damage while maintaining an acceptable cutting ability.



Figure 4a:
Diode laser at 1Watt

Figure4b:
Superpulsed laser at 1Watt
(100 x magnification, courtesy Ultradent)

An investigation by Goharkhay, et al determined incision characteristics and soft-tissue damage resulting from standardized incisions using a wide range of laser modes and parameters of a diode laser at 810nm. Histological examinations were performed to verify vertical and horizontal tissue damage as well

as incision depth and width. No laser damage was visible to the naked eye in the bone underlying the incisions in the range between 0.5-4.5 watts. Their conclusion showed that the diode laser exhibited remarkable cutting ability. Also, the tolerable damage zone clearly showed that the diode laser is a very effective and, because of its excellent coagulation ability, useful alternative in soft-tissue surgery of the oral cavity. In fact, the zone of necrosis is so minimal that the histopathological alterations of biopsy specimens related to diode laser surgery showed no alteration.

A clinical investigation by Capodiferro et al. studied the use of diode laser and its impact on the alteration of premalignant and malignant lesion biopsies. They found that the diode laser provided excellent hemostasis, reduction of pain, healing without suture, and wound healing was always complete in 20-30 days. In the specimens evaluated histologically there was good precision of surgical margins while changes induced by the laser such as coagulation of proteins were present only with high power density output. In this preliminary study no difficulty occurred with the observation of the specimens and no alterations were found. Their recommendation encouraged the use of diode laser for malignant lesions.

Scar formation

Scar formation occurs when fibroblasts secrete collagen that allows the fibroblasts to begin expressing their contractile proteins. This changes them from migratory cells into a cell that can contract and pull a wound tightly together. When the epithelial proteins are pulled into a unidirectional alignment (instead of the normal “basket weave” formation) a scar will form. However when a laser is used, the high activity of fibroblast expression produces new collagen and normal protein alignment, thus creating healthy epithelialization without scar formation. With the mechanism of action explained, and the biological benefits reviewed, the following case report will describe a labial frenectomy using the 810nm diode laser.

Super-Pulsed Laser Treatment: Case #1

The patient presented at the request of their orthodontist for treatment of gingival hyperplasia. **(Figure 5a)** According to Prabhu et al, “It is well known that excessive gingival display in the anterior region can have a very negative impact on the patients smile and psychology. This excessive gingival display could be due to gingival enlargement or altered passive eruption of the teeth. These defects can be corrected through periodontal surgeries.”²³ In this case report, successful aesthetic crown lengthening in maxillary and mandibular anterior teeth using diode laser was described.

Prior to the removal of the orthodontic wires and brackets, it was determined that the tissue would be surgerized. The surgical site was anesthetized using a topical anesthetic and several drops of Zorcaline 1:200,000 with epinephrine was injected locally from between the first maxillary premolars. **(Figure 5a)**

A Gemini super pulse diode laser (Ultradent, Utah) was used to surgically remove the hyperplastic tissue while maintaining esthetics. **(Figure 5b)** To insure the sterility of the procedure, a one-use sterile disposable fiber optic pre-initiated tip was inserted into the pen sized surgical handle. The laser was set to the super pulse mode and the tissues sculpted.



Figure 5a



Figure 5b (Images courtesy of Dr. Robert Miller)

Super-Pulsed Laser Treatment: Case #2

The patient presented for a complete maxillary denture following extraction of her remaining anterior teeth. The maxillary midline frenum demonstrated low insertion, almost to the incisive papilla. To effectively create a comfortable and retentive environment for the denture, a frenectomy was recommended. It should be noted that the patient was not required to discontinue her anticoagulant drug regimen, a benefit of the lasers cauterizing ability.

The surgical site was anesthetized using a topical anesthetic and several drops of Zorcaline 1:200,000 with epinephrine was injected into the frenal base bilaterally. **(Figure 6a)** A Gemini super pulse diode laser (Ultradent, Utah) set to the super pulse mode was used to surgically remove the frenal tissue attachment at the maxillary anterior ridge **(Figure 6b)** using a one-use sterile disposable fiber optic pre-initiated tip.

The high energy imparted to the surgical site eliminated bacterial presence making this as sterile a site can be intraorally. Because of the minimally invasive nature of this procedure, the

wound margins were prevented from drawing together allowing the site to heal by secondary intention and gain the maximum amount of fixed mucosa as dictated by the surrounding tissue.



Figure 6a



Figure 6b

The completed site exhibited no signs of bleeding and had areas of coagulation and minimal char as exhibited in the completed surgical site. It is important to remember that an incised wound of this type will involve deeper structures such as nerves, blood vessels and periosteum.

In regard to the healing process, wound closure of the mucogingiva depends primarily on the nature of tissue disruption. When performing this procedure, healing will take place by secondary intention and begins from the bottom to the surface with the tissue defect filling with both granulation and connective tissue.

Super-Pulsed Laser Treatment: Case #3

The patient presented with an unerupted left central incisor. (Figure 7a) This delayed eruption can be due to a number of local issues. "Localized causes can be dilacerations i.e, deformed root, malpositioning of the tooth, crowding, cysts, odontoma, or trauma to the corresponding milk tooth. The most common local cause of delayed eruption is physical obstruction. These

can occur as a result of supernumerary teeth, mucosal barrier, and tumors."²⁴

In this particular case, a mucosal barrier existed that required removal. Following local anesthesia, the Gemini super pulse diode laser (Ultradent, Utah) on 810 watts was used to perform an operculectomy of the faciao-gingival tissue of the left maxillary central incisor. Following treatment, minimal charring was exhibited and bleeding was eliminated. (Figure 7b)



Figure 7a



Figure 7b (Images courtesy of Dr. Glen Bills)

Conclusion

The dental laser is a tool with the ability to perform minor oral soft tissue surgery and procedures. These devices should always be a consideration when an attempt is made to provide minimally invasive treatment with rapid healing; improved final outcome and superior patient health will be achieved.

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Author Profile

Ian Shuman DDS, MAGD, AFAAID maintains a full-time general, reconstructive, and aesthetic dental practice in Pasadena, Maryland. Since 1995 Dr. Shuman has lectured and published on advanced, minimally invasive techniques. He has taught these procedures to thousands of dentists and developed many of the methods. Dr. Shuman has published numerous articles on topics including adhesive resin dentistry, minimally invasive restorative, cosmetic and implant dentistry. He is a Master of the Academy of General Dentistry, an Associate Fellow of the American Academy of Implant Dentistry, a Fellow of the Pierre Fauchard Academy. Dr. Shuman was named one of the Top Clinicians in Continuing Education since 2005, by *Dentistry Today*.

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Questions

1. A diode laser for oral soft tissue surgery most commonly operates in what spectrum:
 - a. infrared
 - b. visible
 - c. ultraviolet
 - d. gamma
2. A diode laser for oral soft tissue surgery most commonly operates in wavelengths between:
 - a. 410-580nm
 - b. 510-680nm
 - c. 610-780nm
 - d. 810-980nm
3. The chromophores the 810nm diode laser primarily targets are:
 - a. hemoglobin and melanin
 - b. oxyhemoglobin, melanin and water
 - c. hemoglobin, mitochondria and water
 - d. hemoglobin, melanin and serum
4. The diode laser causes which of the following to occur:
 - a. Hemostasis
 - b. reduction in histamine production
 - c. A bactericidal effect
 - d. all of the above
5. The collateral tissue damage caused by improper laser output settings is known as the:
 - a. zone of necrosis
 - b. disruption site
 - c. dead zone
 - d. infrared spectra healing
6. The hemostatic effects of diode lasers will greatly shorten the first phase of the wound healing response, which is:
 - a. swelling and erythema
 - b. scar formation
 - c. bleeding and coagulation
 - d. bleeding and scar formation
7. Eliminating the hemostatic stage allows which of the following to occur:
 - a. the ability to work in a dry field
 - b. reduction of inflammation
 - c. reduced hematoma formation
 - d. all of the above

Questions

8. Scar formation occurs when fibroblasts secrete collagen that allows the fibroblasts to begin expressing:
 - a. Sera
 - b. IgG
 - c. tissue necrosis factor
 - d. contractile proteins
9. When the epithelial proteins are pulled into a unidirectional alignment which of the following will occur:
 - a. healthy wound closure without any sign of scarring
 - b. tissue sloughing
 - c. scar formation
 - d. swelling
10. The dental laser can be considered the gold standard for minor oral soft tissue surgical procedures as it provides:
 - a. minimally invasive treatment
 - b. delayed healing
 - c. rapid healing
 - d. a and c
11. The first working laser was, created in 1960 by
 - a. Theodore Williams
 - b. Ethel Merman
 - c. Theodore H. Maiman
 - d. b and c
12. The first diode laser was introduced in 1962 by Robert N. Hall, and functioned at:
 - a. 810 nm using ruby
 - b. 850 nm using gallium arsenide
 - c. 970 nm using Yttrium
 - d. none of the above
13. All of the following characteristics are true of lasers except:
 - a. hemostatic
 - b. reduction of pain
 - c. decreased scar formation
 - d. echymosis
14. Which of the following led an investigation that determined incision characteristics and soft-tissue damage resulting from standardized incisions using a wide range of laser modes and parameters of a diode laser at 810nm
 - a. Goharkhay
 - b. Tereshkova
 - c. Kotov
 - d. Gubarev
15. Which of the following is true:
 - a. Not all soft tissue diode lasers will provide the ability to operate on soft tissues
 - b. Varying wavelengths offer different cutting abilities
 - c. a and b
 - d. none of the above
16. In devices such as the Gemini, the super-pulsed technology and 20 watts of power allows for
 - a. thermal relaxation between pulses
 - b. provides a smooth cut with less drag
 - c. less charring than seen with a continuous wave laser
 - d. all of the above
17. Which wavelength offers superior coagulation and is ideal for larger areas requiring surgery and sites involving more vascularized tissue
 - a. 780nm
 - b. 810nm
 - c. 870nm
 - d. 930nm
18. The 980nm wavelength is selected for finer tissue sites providing better
 - a. coagulation
 - b. ablation
 - c. anticoagulation
 - d. ataxia
19. In the first clinical case presented, what surgical procedure was performed using a super-pulsed laser
 - a. biopsy
 - b. endarterectomy
 - c. gingivoplasty
 - d. frenectomy
20. Lasers function by using a precise, color of a specific
 - a. trough
 - b. infrared
 - c. diodene
 - d. none of the above
21. The use of diode laser and its impact on the alteration of premalignant and malignant lesion biopsies was investigated clinically by
 - a. Cervelli
 - b. Balboni
 - c. Capodiferro
 - d. Mancuso
22. Reducing collateral thermal damage from diode laser incisions is clinically relevant for promoting
 - a. healing by tertiary intention
 - b. suturing
 - c. wound healing
 - d. a and c
23. When the laser beam light is collimated, or narrowly focused, it is able to stay
 - a. wide over long distances
 - b. wide over short distances
 - c. narrow over short distances
 - d. narrow over long distances
24. A chromophore is the part of the molecule responsible for its
 - a. dimensions
 - b. color
 - c. atomic structure
 - d. organic matrix
25. In devices such as the Gemini, the super-pulsed technology and 20 watts of power allows what to occur:
 - a. smooth cut
 - b. thermal relaxation between the pulses
 - c. less drag
 - d. all of the above
26. Research has shown that mechanical methods of periodontal therapy alone may fail to eliminate the tissue-invasive
 - a. schistosomes
 - b. pathogenic flora
 - c. giardia
 - d. toxoplasma
27. Because of immediate laser hemostasis there is a significant decrease in post-bleeding vasoconstriction and vasodilation that is typically mediated by all but which of the following
 - a. kinins
 - b. histamine
 - c. trikotrienes
 - d. prostaglandins
28. A chromophore is the part of the molecule that absorbs specific wavelengths of
 - a. dark matter
 - b. light
 - c. infrared
 - d. a and c
29. Due to the lasers ability to cauterize tissue, the patient in Case #1 was not required to discontinue what drug regimen
 - a. anticoagulant
 - b. antianxiety
 - c. beta blocker
 - d. glaucoma
30. When the two wavelengths are mixed in super-pulsed mode, what ideal effect is produced
 - a. cutting causes drag
 - b. coagulation is reduced
 - c. the best of coagulation and cutting
 - d. a and b

Notes

[illegible]

[illegible]

Notes

[illegible]

Super Pulsed Dental Lasers

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Educational Objectives

- Understand the history of dental lasers
- Have a working knowledge of the dental laser and its use in soft tissue surgery
- Identify the differences between traditional diode lasers and super-pulsed lasers
- Select the correct laser and settings for proper care

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1. Were the individual course objectives met?

Objective #1: Yes No Objective #2: Yes No

Objective #3: Yes No Objective #4: Yes No

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

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|--|---|-----|---|----|---|---|
| 2. To what extent were the course objectives accomplished overall? | 5 | 4 | 3 | 2 | 1 | 0 |
| 3. Please rate your personal mastery of the course objectives. | 5 | 4 | 3 | 2 | 1 | 0 |
| 4. How would you rate the objectives and educational methods? | 5 | 4 | 3 | 2 | 1 | 0 |
| 5. How do you rate the author's grasp of the topic? | 5 | 4 | 3 | 2 | 1 | 0 |
| 6. Please rate the instructor's effectiveness. | 5 | 4 | 3 | 2 | 1 | 0 |
| 7. Was the overall administration of the course effective? | 5 | 4 | 3 | 2 | 1 | 0 |
| 8. Please rate the usefulness and clinical applicability of this course. | 5 | 4 | 3 | 2 | 1 | 0 |
| 9. Please rate the usefulness of the supplemental bibliography. | 5 | 4 | 3 | 2 | 1 | 0 |
| 10. Do you feel that the references were adequate? | | Yes | | No | | |
| 11. Would you participate in a similar program on a different topic? | | Yes | | No | | |

12. If any of the continuing education questions were unclear or ambiguous, please list them.

13. Was there any subject matter you found confusing? Please describe.

14. How long did it take you to complete this course?

15. What additional continuing dental education topics would you like to see?

If not taking online, mail completed answer sheet to

PennWell Corp.

Attn: Dental Division,
1421 S. Sheridan Rd., Tulsa, OK, 74112
or fax to: 918-212-9037

For IMMEDIATE results,
go to www.DentalAcademyOfCE.com to take tests online.
INSTANT EXAM CODE 15243
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- | | |
|---------------------|---------------------|
| 1. (A) (B) (C) (D) | 16. (A) (B) (C) (D) |
| 2. (A) (B) (C) (D) | 17. (A) (B) (C) (D) |
| 3. (A) (B) (C) (D) | 18. (A) (B) (C) (D) |
| 4. (A) (B) (C) (D) | 19. (A) (B) (C) (D) |
| 5. (A) (B) (C) (D) | 20. (A) (B) (C) (D) |
| 6. (A) (B) (C) (D) | 21. (A) (B) (C) (D) |
| 7. (A) (B) (C) (D) | 22. (A) (B) (C) (D) |
| 8. (A) (B) (C) (D) | 23. (A) (B) (C) (D) |
| 9. (A) (B) (C) (D) | 24. (A) (B) (C) (D) |
| 10. (A) (B) (C) (D) | 25. (A) (B) (C) (D) |
| 11. (A) (B) (C) (D) | 26. (A) (B) (C) (D) |
| 12. (A) (B) (C) (D) | 27. (A) (B) (C) (D) |
| 13. (A) (B) (C) (D) | 28. (A) (B) (C) (D) |
| 14. (A) (B) (C) (D) | 29. (A) (B) (C) (D) |
| 15. (A) (B) (C) (D) | 30. (A) (B) (C) (D) |

AGD Code 135

PLEASE PHOTOCOPY ANSWER SHEET FOR ADDITIONAL PARTICIPANTS.

COURSE EVALUATION and PARTICIPANT FEEDBACK

We encourage participant feedback pertaining to all courses. Please be sure to complete the survey included with the course. Please e-mail all questions to: lhodges@pennwell.com.

INSTRUCTIONS

All questions should have only one answer. Grading of this examination is done manually. Participants will receive confirmation of passing by receipt of a verification form. Verification of Participation forms will be mailed within two weeks after taking an examination.

COURSE CREDITS/COST

All participants scoring at least 70% on the examination will receive a verification form verifying 3 CE credits. The formal continuing education program of this sponsor is accepted by the AGD for Fellowship/Mastership credit. Please contact PennWell for current term of acceptance. Participants are urged to contact their state dental boards for continuing education requirements. PennWell is a California Provider. The California Provider number is 4527. The cost for courses ranges from \$20.00 to \$110.00.

PROVIDER INFORMATION

PennWell is an ADA CERP Recognized Provider. ADA CERP is a service of the American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CERP does not approve or endorse individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry.

Concerns or complaints about a CE Provider may be directed to the provider or to ADA CERP at www.ada.org/cotocerp/

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RECORD KEEPING

PennWell maintains records of your successful completion of any exam for a minimum of six years. Please contact our offices for a copy of your continuing education credits report. This report, which will list all credits earned to date, will be generated and mailed to you within five business days of receipt.

Completing a single continuing education course does not provide enough information to give the participant the feeling that s/he is an expert in the field related to the course topic. It is a combination of many educational courses and clinical experience that allows the participant to develop skills and expertise.

CANCELLATION/REFUND POLICY

Any participant who is not 100% satisfied with this course can request a full refund by contacting PennWell in writing.

IMAGE AUTHENTICITY

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