Platelet-rich fibrin vs. connective tissue graft: a literature review

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Abstract
Gingival defects can be treated in multiple ways. The current gold standard connective tissue graft (CTG) in order to treat Class I and II Miller defects (Chambrone, 2008). One of the newer procedures is the use of platelet-rich fibrin (PRF) therapy, which involves drawing the patient’s own blood and forming a membrane to heal gingival defects. This literature review looks at scholarly articles comparing the use of PRF to CTG in healing clinical attachment loss (CAL) over a period of 6 months and whether one is more effective than the other in gaining CAL.

Methods
The study of the use of platelet-rich fibrin (PRF) therapy compared to connective tissue graft (CTG) surgery in terms of clinical attachment level after 6 months was done through a review of the literature.

Discussion
One comprehensive systematic review compared the use of PRF in various dental procedures and concluded that PRF compared to CTG had no statistically significant differences, although both increased periodontal values in general, including CAL (Miron, 2017). In multiple clinical trials, researchers compared PRF and CTG after 6 months by measuring multiple periodontal statistics, including CAL and most showed significant improvement in CAL but the difference between the two procedures was not statistically significant. One study came to the conclusion that more layers of PRF had an effect on CAL value (Culhaoglu, 2018).

A randomized clinical trial comparing PRF and CTG found similar results when comparing postoperative statistics regarding CAL. However, this study did conclude that PRF had decreased postoperative discomfort when compared to CTG (Oncu, 2017). Another clinical trial measured healing index (HI) for the participants as well, and they found significant increases in HI for immediate postoperative values (Culhaoglu, 2018). A different clinical trial compared HI between PRF and CTG and found differences in favor of PRF after 1 week, but the interval diminishes after that period of time (Mufti, 2017).

One of the relatively newer innovations in gum surgeries is the use of platelet-rich fibrin (PRF) therapy in conjunction with pedicle flap surgery. This method has been shown to contain various growth factors, which help promote cell proliferation and tissue regeneration. It is meant to be replacing the connective tissue used in CTG in adjunct with CAP and does not replace the need for a surgical flap. One of the reasons for using PRF instead of CTG is the lack of a second donor site for tissue, which could potentially cause less discomfort for the patient. Both procedures are very similar, since both often require the need for a surgical flap, and the major difference is the chosen material underlying the tissue flap. PRF is becoming more widespread due to its promotion of accelerated healing.

The current generation of PRF involves extracting blood from the patient’s own body and collected in tubes without anticoagulants. The blood is centrifuged immediately after collection. A fibrin clot forms in the tube between the layer of red blood cells and plasma, and this yellow clot is separated from the clotted blood cells. The clot is compressed into a thin membrane that is a uniform thickness. The membrane is placed in the area of the mucogingival defect and a pedicle flap is used to hold the membrane in position to allow for maximum integration with the surrounding tissue.

Conclusion
According to the current research, there is no statistically significant evidence to suggest that PRF has a greater gain in CAL when compared to CTG over a period of 6 months. Some studies showed that both PRF and CTG have statistically significant increases in CAL but comparing the data between the two procedures does not yield enough significant difference to definitively conclude that one procedure provides more improvement than the other. However, some studies have shown that PRF has superior immediate post-operative healing compared to CTG. PRF also contains numerous growth factors that promote accelerated healing as well, which means the risk of post-operative complications is decreased.

Because PRF is a relatively novel procedure when treating gingival defects, there is a lack of studies comparing its effectiveness to CTG. There are many clinical trials and single clinical case studies, as well as split-mouth randomized studies. It was difficult to find systematic reviews and meta-analyses comparing PRF to CTG together.

There was also a lot of conflicting research between the various articles. The formation of the PRF membrane is not currently a standardized process, and clinicians have varying protocol nuances. Some of the variations include centrifuge time, types of centrifuges, membrane thickness, membrane size, and amount of blood drawn. Therefore, the resulting information taken from literature reviews may not be as accurate than if the clinical procedure was standardized to eliminate the margin of error and increase external validity.

In order to have a more definitive answer about the comparison between PRF and CTG in terms of long-term CAL changes, more research needs to be conducted. Based off of current research, it appears that PRF is a suitable alternative to CTG but there is not enough evidence backing PRF as a superior treatment option.

References

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Gingival defects can be treated in multiple ways. The current gold standard is connective tissue graft (CTG) in order to treat Class I and II Miller defects (Chambrone, 2008). One of the newer procedures is the use of platelet-rich fibrin (PRF) therapy, which involves drawing the patient’s own blood and forming a membrane to heal gingival defects. This literature review looks at scholarly articles comparing the use of PRF to CTG in healing clinical attachment loss (CAL) over a period of 6 months and whether one is more effective than the other in gaining CAL.
Introduction

According to data from the 2009 and 2010 National Health and Nutrition Examination Survey (NHANES), over 47% of the adult population of the United States age 30 and over has periodontal disease, which can be approximated to 64.7 million Americans. Periodontitis is a disease of the gums surrounding the teeth in the oral cavity and may lead to serious consequences if not treated appropriately. The most common reason for tooth loss in adults over the age of 45 is periodontitis and has also been linked to a variety of systemic diseases as well, including Type II diabetes, osteoporosis, obesity, and many other conditions (Amar, 2006).

The American Academy of Periodontology classifies the severity of periodontitis through a variety of factors, one of which is clinical attachment loss (CAL) (Tonetti, 2018). The CAL is a sign of how much attached gingiva is missing from its original height on the tooth and is usually an indicator of active or previous history of periodontitis. When bone starts to recede, the gingival tissue may follow, which is why maintaining CAL is important. Gum and bone recession are both possible indicators of periodontitis.

Gum recession can result from multiple reasons, with periodontal disease being one of the most common. The gum separating the teeth starts to pull away, revealing more of the tooth’s root surface. Miller’s classification is one standardized way of measuring the severity of gum recession. A Class I Miller defect is recession that has not extended to the mucogingival junction (MGJ) yet, and a Class II is one that has extended to or beyond the MGJ without any loss of bone or soft tissue (Akram, 2016).

When a patient has multiple gum defects or severe gum recession, one of the options for treatment is gum surgery. Some of the possible indications for gum surgery include dentinal
hypersensitivity, esthetics, and preventing the progression of further recession. The risk of developing root caries also increases with root exposure.

One common surgery is the gum graft in which tissue is taken from a different source and grafted onto the area of recession. Tissue can be taken from the patient’s own body from a separate location or from a donor, such as a cadaver or animal tissue. The current gold standard for gum surgery is connective tissue graft (CTG) surgery. This involves taking a piece of tissue from the patient’s own body, and the donor site is usually the hard palate. The difference between CTG compared to other types of tissue graft is that CTG takes specifically subepithelial tissue and leaves the epithelial tissue intact at the donor site (Chambrone, 2008). This accelerates the healing process due to leaving behind intact epithelium. CTG surgery is often used in conjunction with a coronally advanced flap (CAF), in which a pedicle flap is formed at the site of the recession and the connective tissue is placed between the periosteum and the overlying pedicle flap. This provides continued blood supply to the area.

One of the relatively newer innovations in gum surgeries is the use of platelet-rich fibrin (PRF) therapy in conjunction with the surgery. This process was the result of experimentation with platelet-rich plasma (PRP), which was a technique used to isolate large amounts of platelets from the blood and use them to aid in accelerating wound healing. One of the limitations of PRP was the need to combine the resulting liquid with other biomaterials such as bone graft particles, so PRF was developed as a means to have all healing factors in a solid state of matter that was more manageable. The material could not have any anticoagulants to prevent clotting before placement into the body and centrifuging specimens was the only way to retrieve healing factors in a solid layer. The platelet clot has been shown to contain various
growth factors, which help promote cell proliferation and tissue regeneration. PRF is becoming increasingly widespread due to its promotion of accelerated healing. It is being used due to its ability to potentially regenerate periodontal structures such as the periodontal ligament. The growth factors in PRF have been shown to stimulate fibroblasts to differentiate at an increased rate, therefore promoting regeneration of the PDL (Goel, 2018). The PRF material is most commonly used in combination with surgery, similarly to CTG, with the most frequent being a pedicle flap. It is meant to be replacing the connective tissue used in CTG in adjunct with CAF and does not replace the need for a surgical flap. One of the reasons for using PRF instead of CTG is the lack of a second donor site for tissue, which could potentially cause less discomfort for the patient. The PRF procedure is also relatively easier compared to CTG since it requires fewer steps. Both CTG and PRF procedures are very similar, since both often require the need for a surgical flap, and the major difference is the chosen material underlying the tissue flap.

The current generation of PRF involves extracting blood from the patient’s own body and collected in tubes without anticoagulants. The blood is centrifuged immediately after collection. A fibrin clot forms in the tube between the layer of red blood cells and plasma, and this yellow clot is separated from the clotted blood cells. The clot is compressed into a thin membrane that is a uniform thickness. The membrane is placed in the area of the mucogingival defect and a pedicle flap is used to hold the membrane in position to allow for maximum integration with the surrounding tissue.

Methods
The study of the use of platelet-rich fibrin (PRF) therapy compared to connective tissue graft (CTG) surgery in terms of clinical attachment level after 6 months was done through a review of the literature.

**Discussion**

One comprehensive systematic review compared the use of PRF in various dental procedures. The researchers concluded that PRF compared to CTG had no statistically significant differences, although both increased periodontal values in general, including CAL (Miron, 2017). In one clinical trial, researchers compared PRF and CTG after 6 months by measuring multiple periodontal statistics, including CAL. Both showed significant improvement in CAL but the difference between the two procedures was not statistically significant (Mufti, 2017). A different clinical study had a similarly structured trial in which periodontal statistics between PRF and CTG were compared, and the researchers came to the conclusion that more layers of PRF had an effect on CAL value, but the difference between the two procedures was not statistically significant (Culhaoglu, 2018). Researchers in another split mouth randomized controlled study studied the effects of PRF when used in conjunction with flap surgery. They found that that there was a gain in CAL after 6 months and there was a statistically significant difference between utilizing PRF and without it (Padma, 2013).

Researchers of a systematic review and meta-analysis studied the use of PRF in randomized clinical trials with follow up periods of 6 months in the treatment of Miller Class I and II gingival defects. The study concluded that the difference in CAL was not statistically significant between the studied groups (Moraschini, 2016). One systematic review studied the use of PRF in root coverage surgeries and found that most research was contradictory, but that
PRF appears to have an advantage in regards to biotype and gingival tissue width. They did not find any significant findings about CAL (Verma, 2017). A different systematic review solely researched CTG and found that it was effective in increasing CAL, but did not produce any significant difference when comparing CTG to other procedures, including surgeries with resorbable membranes (Chambrone, 2008).

A randomized clinical trial comparing PRF and CTG found similar results when comparing postoperative statistics regarding CAL. However, this study did conclude that PRF had decreased postoperative discomfort when compared to CTG (Oncu, 2017). Another clinical trial measured healing index (HI) for the participants as well, and they found significant increases in HI for immediate postoperative values (Culhaoglu, 2018). A different clinical trial compared HI between PRF and CTG and found differences in favor of PRF after 1 week, but the interval diminishes after that period of time (Mufti, 2017).

Conclusion

According to the current research, there is no statistically significant evidence to suggest that PRF has a greater gain in CAL when compared to CTG over a period of 6 months. There is not enough evidence to suggest that PRF is superior to CTG in general when it comes to other periodontal statistics as well. Some studies show that both PRF and CTG have statistically significant increases in CAL but comparing the data between the two procedures does not yield enough significant difference to definitively conclude that one procedure provides more improvement than the other. However, some studies have shown that PRF has superior immediate post-operative healing compared to CTG. This could be because PRF does not require a second donor site for tissue like CTG does, which means one less site for the body to
heal, resulting in decreased discomfort for the patient. PRF also contains numerous growth factors that promote accelerated healing as well, which means the risk of post-operative complications is decreased. PRF can also be an arguably simpler procedure than CTG since there are fewer steps, and some patients may prefer shorter appointments.

Because PRF is a relatively novel procedure when treating gingival defects, there is a lack of studies comparing its effectiveness to CTG. There are many clinical trials and single clinical case studies, as well as split-mouth randomized studies. It was difficult to find systematic reviews and meta-analyses comparing PRF to CTG together. There are multiple journal articles that are systematic reviews of the procedures separately. There is also a lot more research done on the application of PRF in other dental procedures, such as extraction site healing and fixing intrabony defects.

There was also a lot of conflicting research between the various articles. The formation of the PRF membrane is not currently a standardized process, and clinicians have varying protocol nuances. Some of the variations include centrifuge time, types of centrifuges, membrane thickness, membrane size, and amount of blood drawn. Therefore, the resulting information taken from literature reviews may not be as accurate than if the clinical procedure was standardized to eliminate the margin of error and increase external validity. Researchers also studied different aspects of PRF in different trials. For example, one clinical trial compared the effectiveness of varying amounts of PRF membrane layers and its effect on healing. Not every study chose to measure CAL at the end of the clinical trials. Data on gingival biotype and biological width was more frequently collected. The current research is also not standardized,
and there was some variation amongst researchers on the way they measure CAL. Some studies utilized a Marquis probe and others used marked acrylic stents.

In order to have a more definitive answer about the comparison between PRF and CTG in terms of long-term CAL changes, more research needs to be conducted. Based on current research, it appears that PRF is a suitable alternative to CTG but there is not enough evidence backing PRF as a superior treatment option.
References


