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Sinus-lift for implant placement is a very predictable and reproducible surgery. The choice of the technique, either lateral using a Caldwell-Luc osteotomy or axial with the Summers osteotomy, is mainly dependent on the residual bone height of the alveolar ridges, and both techniques show similar results. One key question that remains is to define the best filling material for the sinus cavity after lifting the sinus membrane. The consensual approach is to consider that most materials are efficient for this surgery, considering the high osteogenic potential of the Schneiderian membrane and its periosteum-like behavior. However, the choice of material or association of materials will influence the waiting period before adequate healing and remodeling of the grafted material, implant placement, and functional loading. Many materials are potentially usable in this clinical situation: autogenous bone graft (parietal, iliac, chin, retromolar, etc), xenograft (bovine, swine, etc), and allograft or synthetic (β-tricalcium phosphate, hydroxyapatite, etc). Recently, the possibility of sinus-lift without any grafted material is hotly debated, following the concepts of guided bone regeneration. Indeed, in a closed cavity such as a lifted sinus, the osteogenic potential of the bone and the sinus membrane is highly protected and efficient. This concept of limited grafting was first developed with the Summers osteotomy, using no grafting material even in thin residual bone height. And, recently, authors have shown that a full sinus-lift can be performed using the lateral approach with whole blood as sole filling material.

Purpose: To assess the relevance of simultaneous sinus-lift and implantation with leukocyte- and platelet-rich fibrin (L-PRF, Choukroun’s technique) as sole sinus filling material.

Materials: Twenty-three lateral sinus elevations (SA4 sinus) were performed on 20 patients with simultaneous implant placement. Seven patients were treated with 19 Astra implants (AstraTech, Möndlal, Sweden) and 13 patients with 33 Intra-Lock implants (Intra-Lock Ossean, Boca Raton, FL). L-PRF membranes were used to cover the Schneiderian membrane, the implant tips served as “tent pegs” for the L-PRF-patched sinus membranes, and the sinus cavity was finally filled with L-PRF clots. Clinical and radiographic follow-up was performed just after implant placement, after 6 months, 1 year and each following year.

Results: Six months after surgery, all implants were clinically stable during abutment tightening. The maximum follow-up was 6 years, and all patients were followed up for a minimum of 2 years. No implant was lost during this 6-year experience, and the vertical bone gain was always substantial, between 8.5 and 12 mm bone gain (10.4 ± 1.2). The final level of the new sinus floor was always in continuation with the implant apical end, and the perimplant crestal bone height was stable.

Conclusion: The use of L-PRF as sole filling material during simultaneous sinus-lift and implantation seems to be a reliable surgical option promoting natural bone regeneration.

Key Words: dental implant, fibrin, platelet-rich fibrin, platelet-rich plasma

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implantation\textsuperscript{11}: implants are stabilized in the residual bone height, and their tips keep membrane to the adequate height such as “tent pegs.” The main problem of this approach is that filling the sinus cavity with a stabilized blood clot is not that easy in everyday practice. Moreover, this technique implies that there should be a perfect membrane lifting without membrane tears.

Choukroun’s platelet-rich fibrin (PRF) is actually the more simple and inexpensive technique available in the field of platelet concentrate technologies.\textsuperscript{12} It was first described by Choukroun \textit{et al.}\textsuperscript{13} in 2001 in France and was classified as a leukocyte- and platelet-rich fibrin (L-PRF) concentrate.\textsuperscript{12} In this simple technique, blood is collected without anticoagulant and immediately centrifuged with low forces. Three layers appear in the tube then: a red blood cell base at the bottom, an acellular plasma as supernatant (platelet-poor plasma), and a PRF clot in the middle.\textsuperscript{14} This product is very different from the common previously described platelet-rich plasma (PRP): Choukroun’s PRF is a consistent fibrin biomaterial and not a platelet-enriched fibrin glue such as the various platelet-rich plasmas.\textsuperscript{15} Moreover, the protocol being very inexpensive and easy, many PRF clots can be produced simultaneously: a very significant volume of biomaterial can be produced in less than 20 minutes. The clots can then be transformed into fibrin membranes by compression between sterile gauzes or by using the PRF Box (Process, Nice, France), a surgical box especially designed to collect and standardize PRF clots and membranes.\textsuperscript{16}

Each PRF concentrate most platelets and more than the half of the leukocytes from a 9-mL blood harvest, merged or enmeshed into a dense fibrin network.\textsuperscript{17–19} This fibrin biomaterial releases high amounts of growth factors (such as transforming growth factor β1, platelet-derived growth factor AB, and vascular endothelial growth factor) and matrix glycoproteins (such as thrombospondin-1) during at least 7 days \textit{in vitro}.\textsuperscript{20} Some PRF applications were already described in oral and maxillofacial surgery.\textsuperscript{21,22} ENT and plastic surgery,\textsuperscript{23,24} and preimplant and implant surgery.\textsuperscript{25–30} In a first publication on this subject,\textsuperscript{26} it was assessed that a sinus grafting material built with allograft and PRF in equal volume was suitable for implantation after only 4 months and potentially even more mature than a sole allograft after 8 months. Another study\textsuperscript{27} showed that PRF membranes were easy to use during Summers osteotomy and offered a good compromise as filling material, shock absorber during sinus floor elevation, and healing support for the damaged Schneiderian membrane.

The objectives of this work were to describe the use of PRF clots and membranes as sole filling material during lateral sinus-lift with immediate implantation, the evolution of the technical procedure during a 6-year period, and the clinical success rate of this procedure in a significant case series.

### Description of the Technical Procedure

#### PRF Preparation

PRF clots and membranes were prepared as described by Choukroun \textit{et al.}. During surgery, 72 mL whole blood was drawn in 8 glass-coated plastic tubes,\textsuperscript{31} without anticoagulant, and was immediately centrifuged at about 400g during 12 minutes, using a table centrifuge specifically designed for this application (PC02; Process). Platelets were immediately activated, thus triggering a coagulation cascade. The result was a fibrin clot located in the middle of each tube. Each clot was removed from the tube and separated from the red blood cell base with pliers, then stored in metal cups before sinusus filling. Some clots were gently pressed in between 2 sterile compresses to obtain an autologous fibrin membrane. Five clots and 3 membranes were generally produced in this way for the treatment of each sinus.

![Fig. 1. This patient was 1 of the first of this series. CT-scan was performed before surgery and showed a SA4 sinus anatomy (A, B), with a thin residual bone height (often less than 2 mm). During surgery, 2 significant perforations were done in the Schneiderian membrane while detaching the window bone plate from the membrane (G). The sinus membrane was then carefully lifted and covered with 2 PRF membranes to close the perforations. AstraTech implants were inserted, and their tip blocked the PRF-patched sinus membrane in high position (D). The sub sinus cavity was then filled with PRF clots, and the bone window was finally closed with a PRF membrane only, the bone window fragment being too big and, thus, difficult to block correctly to close the sinusus regeneration cavity (E).](image)
the last cases, the PRF box was systematically used for the collection and preparation of standardized clots and membranes.

Initial Technique, Started in 2003

In this case series, 23 sinus elevations were performed on 20 patients between January 2003 and January 2008 with Choukroun’s PRF as sole filling biomaterial. All the treated sinuses showed severe maxillary resorption (Figs. 1 and 2) and were all classified as SA4 (<5 mm residual bone height under the sinus).32

Two implant systems were used during this period. From 2003 to January 2006, all cases were treated with Astra implants (AstraTech, Mölndal, Sweden). From January 2006 up to now, all cases were treated with Intra-Lock implants (Intra-Lock, Boca Raton, FL).

The initial technique was a classical lateral sinus-lift using the Caldwell-Luc approach. Surgery was performed with local anesthesia. Access to the buccal maxillary wall was achieved via a mucosal crestal incision and anterior and posterior releasing vestibular incisions. A large bone window was outlined using a diamond bur on a surgical handpiece, with constant saline irrigation. After careful elevation of the Schneiderian membrane, the bone window was still attached to the membrane and served as a new sinus floor. In one of the first cases, the bone plate was carefully separated from the lifted sinus membrane (Fig. 1) to close the subsinus cavity after filling; however, the bone fragment was finally unusable, because it was too large and difficult to stabilize correctly (it would have lead to a bone sequestrum).

Two PRF membranes were placed on the Schneiderian membrane to protect it before implant drilling and to heal all visible or invisible holes and tears of the sinus membrane. Implant sites were then prepared with a careful drilling. To avoid sinus membrane perforation and to compress the residual bone height, the final stage of osteotomy was performed with a manual osteotome. Implants were then inserted in compression within the residual alveolar bone. Implant stability was always obtained because of the tapered profiles and the microthreaded collars of the implants. The end of the implants always touched the PRF membranes covering the released sinus membrane and served as tent pegs (Fig. 1, D).

Five PRF clots on average were then inserted and compressed inside the subsinus cavity to fill all the volume stabilized with the implants. Finally, 1 PRF membrane was used to cover the osteotomy window and protect the filled subsinus from potential mucogingival invagination (Fig. 1, E).

For postoperative management, medications were prescribed, including chlorhexidine rinses twice a day until sutures removal, 1 g amoxicillin (2 times daily for 6 days; pristinamycin 2 × 100 mg, 2 times daily was prescribed in penicillin-sensitive patients), ibuprofen (400 mg) 4 times daily unless medically contraindicated, and pain medication as needed for pain. Patients were not allowed to use any removable prosthesis. The sutures were removed 8 to 10 days postoperatively.

Evolution of the Technique

The first main evolution appeared since 2005 and was related to the position and size of the Caldwell-Luc bony window. In the first cases, the window was outlined quite close from the crestal horizontal part (~4 mm above the crestal line), and the sinus was widely opened, using a quite large bone incision (Fig. 1, C and D). This technique allowed a better viewpoint and control of the PRF membranes and implant placement but presented some disadvantages. Indeed, tapered implants were inserted in compression with a quite high torque and blocked in the residual bone height (thin in SA4 sinus), and crestal fractures may occur. This event could have severe consequences, because this technique required the implants to be stable and to maintain the sinus membrane in
high position. Moreover, a large bone window reduced the regeneration potential of the subsinus cavity walls and could, thus, impair bone healing. Thus, it was quickly decided to reduce the size of the bony window and to place the window in the upper part of the sinus wall, 6–8 mm above the crestal line (Fig. 3). These simple evolutions of the technique seemed highly beneficial to secure this procedure and to increase the bone regeneration potential of the filled sinus cavity.

The second main change was related to the use of the bone plate (from the access window) during the surgery. In the last cases of this series, it was decided to carefully separate the bone plate (from the access window) from the lifted sinus membrane and to use it for subsinus cavity closure after filling with the PRF clots. To block this bone plate in the right position, this rectangular fragment could be placed transversely on the bone window, and the final PRF membrane was placed over it. This modified technique seemed relevant to increase the regeneration potential of the filled subsinus cavity.

RESULTS OF A 6-YEAR EXPERIENCE

This clinical experience is based on a case series of 23 sinus elevations performed on 20 patients between January 2003 and January 2008 with Choukroun’s PRF as sole filling biomaterial. Patients were 12 women (60%) and 8 men (40%) with a mean age of 59.8 ± 11.1 years, from 37 to 80 years.

Both the implant systems used in this study show similar profile, with a typical tapered and microthreaded collar. It was the more adequate implant shape and design for this specific application where implants have to be placed in a very limited residual bone height. In this case series, a total of 52 implants were placed. Seven patients were treated with 19 Astra implants (AstraTech; Figs. 1 and 2), and 13 patients with 33 Intra-Lock implants (Ossean; Intra-Lock, Boca Raton, FL; Fig. 3). Astra implants were 13 mm long and 4.5 mm in diameter; Intra-Lock implants were 11.5 or 13 mm long and 4.3 mm in diameter.

Implants were inserted in 23 first molar, 19 second molar, and 10 premolar sites, under clean but not sterile conditions as defined by Scharf and Tarnow.33 In 3 patients, clear sinus membrane perforations were noticed during the sinus-lift and patched easily with PRF membranes (Fig. 1). After surgery, healing was uneventful for all patients. Six months after surgery, all implants were clinically stable during abutment tightening.

The maximum follow-up was 6 years, and all patients were followed up for a minimum of 2 years. Clinical follow-up was associated with retroalveolar and panoramic x-rays just after implant placement, after 6 months, after 1 year, and finally after each following year (Figs. 2 and 3). In some cases, low-dose volumetric computed radiography or CT scan examinations were performed 6 months after sinus-lift surgery, and even sometimes after 1 year or more, to evaluate accurately the sinus bone gain around each implant.

The main results in this case series were that no implant was lost during this 6-year experience and that the vertical bone gain (assessed by x-ray follow-up)
was always substantial and stable. All implants were inserted in a residual bone height between 1 and 3 mm (1.8 ± 0.5). Thus, the final bone gain was always very significant with these quite long implants, between 8.5 and 12 mm bone gain (10.4 ± 1.2). The final level of the new sinus floor was sometimes difficult to assess precisely with only x-rays as investigation tools, but it seemed that the position of the final sinus floor was always in the continuation of the implant end (Figs. 2 and 3).

The periimplant crestal bone height was always very stable. This result could be associated with the typical microthreaded profiles and the similar platform-switching prosthetic system of both implant systems. It proved that this kind of screw implants placed in residual bone height can maintain a strong periimplant bone tissue as long as they are blocked in stable position.

No statistical comparison between the different implant systems was performed to define which implant system was the more efficient for bone gain around implants. Indeed, in this technique, implants were used as tent pegs to delineate the bone regeneration chamber, and the implant shape or surface did not seem to influence the position of the new sinus floor.

**Discussion**

**PRF Membrane, an Inexpensive and Powerful Tool to Secure Sinus-Lift**

Filling or not filling during sinus-lift? During sinus-lift, the biomaterials are used as space maintainers and bone scaffold to promote bone regeneration in the sub sinus area. The general consensus is that many biomaterials are usable in the sinus, because of the high osteogenic activity of the Schneiderian membrane. Consequently, both crestal approach with osteotome (Summers technique) and lateral sinus-lift can easily be performed without any material, particularly for small grafting volume. Unfortunately, when no filling is used, some authors have shown that the true bone gain is in fact always limited and that implant apical ends might be enmeshed in the sinus connective tissue and, thus, not osseointegrated.

Choukroun’s PRF is a simple and inexpensive technique that can be used currently in daily practice. This technique is the simplest and cheapest way to produce autologous fibrin membrane or platelet concentrate. The systematic use of this biomaterial during sinus-lift, with or without bone substitute, seems a very interesting option, particularly for the protection of the Schneiderian membrane. Moreover, the use of PRF as sole filling material seems able to stabilize a quite high amount of bone around the implants: indeed, in this case series, the long term follow-up showed that periimplant bone finally stabilized up to the implant end. This result was quite different from some actual available data about the sinus-lift procedure without any material, and it showed that the use of PRF, as an optimized natural blood clot, seemed to avoid the enmeshment of the implant end in a thick sinus connective tissue.

This result could be the consequence of the applications of PRF membranes on the Schneiderian membrane. Indeed, a PRF cover on the sinus membrane can potentially improve the healing of the membrane, induce a stimulation of the periosteum, and perhaps stabilize a new bone volume at the end of the implant. This effect may be both related to the platelet and fibrin content of the PRF membrane. From a practical standpoint, the use of PRF membranes on the Schneiderian membrane is a simple mechanical and biological protection that can be used in daily practice, whatever the filling material.

Therefore, we can clearly answer the question: Filling or not filling during sinus-lift? Filling is not absolutely necessary because the natural blood clot inside the sinus chamber is enough for bone healing; but filling at least with PRF, ie, optimized blood clots, seems the adequate alternative to improve natural healing and to secure the surgical procedure.

**Implant Design and Evolution of the Technical Procedure**

In this case series, all implants achieved primary stability even in a thin residual bone height. Implant stabilization was achieved by the microthreads of the implant collar and its adequate tapered profile. This implant design seems the best for such sinus implantation, to block correctly the implant, but other designs could be discussed, such as microthreaded non-tapered implants or tapered nonmicrothreaded implants. However, it seems very important to be as cautious as possible with this technique and to use the more adequate profile from the mechanical point of view.

The influence of the implant shapes and surfaces on the bone regeneration in the cavity could also be discussed, because both implants used in this series showed improved surfaces. New surfaces (such as Astra Osseospeed or Intra-Lock Ossean) influence bone cell response, and it could, thus, be a relevant parameter to improve local bone regeneration.

Another key point was revealed in this case series, concerning the effect of the PRF membrane placed on the sinus bone window. It is often considered that the lateral window of the sinus should be protected with a membrane (such as collagen membranes) to avoid invagination of the mucogingival tissues in the sinus cavity. The general explanation about this phenomenon is that the sinus cavity must be protected with a barrier such as a guided bone regeneration area. In the first cases of this series, PRF membranes were used as sole protection membrane covering each sinus window. The x-ray analyses of these cases 6 months after surgery showed no invagination/fibrosis, and a neat cortical limit was clearly observed after 3 years, even if the cortical surface appeared to be a little bit depressed at the level of the wide bone window (this was another argument to reduce the size of the window).

This result indicated that PRF membranes alone were able to protect the sinus graft area. This point is very interesting, because PRF is an inexpensive autologous biomaterial with a significant slow release of growth factors and could easily replace xenogeneic and expensive collagen membranes in this application.
CONCLUSION

The use of PRF as sole grafting material during simultaneous sinus-lift and implantation is a secure and reliable option. This autologous and inexpensive material can be considered as an optimized blood clot, and this L-PRF matrix seems a relevant biomaterial for natural bone regeneration. However, in this technique, the experience of the surgeon and the choice of the implant profile are also significant parameters, because implant stability in the residual alveolar ridge is the key condition to the firm support of the implants as tent pegs on the Schneiderian membrane. Finally, by extension, the systematic use of PRF during sinus-lift, with or without bone grafting material, may be beneficial, particularly for the protection of the Schneiderian membrane, and should be analyzed in further studies.

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Disclosure

Dr. Joseph Choukroun is the inventor of the PRF technique and scientific director of Process, Nice, France, a medical company that distributes in France the adapted PRF centrifuge and preparation kits (certified for use outside of hospitals and blood banks) under the direct control and agreement of the French Health Ministry. However, the Choukroun’s PRF is a free and open access protocol; so, there is no financial conflict of interest. The other authors have no competing financial interests to disclose in this work.

REFERENCES


Implante y elevación simultánea del seno usando implantes con micro rosas y L-PRF como único material de injerto: Experiencia de 6 años.

ABSTRACTO: Propósito: Para evaluar la relevancia del implante y elevación simultánea del seno con L-PRF (fibrina rica en plaquetas y leucocitos, técnica de Choukroun) como único material de relleno en el subseno. Materiales y métodos: Se realizaron 23 elevaciones temporales del seno (senos SA4) en 20 pacientes con colocación simultánea del implante. Siete pacientes fueron tratados con 19 implantes (Astra Tech, Möln达尔, Suecia), y 13 pacientes con 33 implantes (Intra-Lock Ossean, Boca Raton, FL). Se usaron membranas de L-PRF para cubrir la membrana Schneideriana, las puntas de los implantes sirvieron como "estacas de carpa" de las membranas del seno remendadas con fibrina. El seguimiento mínimo fue de 6 años, todos los implantes estaban clínicamente estables durante el apretado de los linderos. El seguimiento máximo fue de 6 años, y todos los pacientes fueron seguidos durante un mínimo de 2 años. No se perdió ningún implante durante esta experiencia de 6 años y la ganancia vertical del hueso fue siempre importante, entre 8.5 y 12 mm de ganancia de hueso (10.4 ±1.2). El nivel final del piso del nuevo seno estuvo siempre en continuación con el extremo apical del implante y la altura del hueso cresta periimplante fue estable. Conclusión: El uso de L-PRF como único material de relleno durante un implante y elevación simultánea del seno parece ser una opción quirúrgica confiable para promover la regeneración natural del hueso.

PALABRAS CLAVES: Implante dental, fibrina, fibrina rica en plaquetas (PRF por sus siglas en inglés), plasma rico en plaquetas (PRP por sus siglas en inglés)

PORTUGUÊS / PORTUGUÊS

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Elevação e implantação simultâneas da cavidade usando implantes microrrosqueados e L-PRF como único material de enxertamento: experiência de 6 anos.

RESUMO: Objetivo: Avaliar a relevância da elevação e implantação simultâneas da cavidade com L-PRF (Fibrina Rica em Leucócitos e Plaquetas, técnica de Choukroun) como único material de enchimento da subcavidade. Material e Métodos: 23 elevações da cavidade lateral (cavidade SA4) foram realizadas em 20 pacientes com colocação simultânea de implante. Seta pacientes foram tratados com 19 implantes (Astra AstraTech, Möln达尔, Suécia) e 13 pacientes com 33 implantes (Intra-Lock Intra-Lock Ossean, Boca Raton, FL). Membranas L-PRF foram usadas para cobrir a membrana Schneideriana, as pontas do implante serviram como "paus de barraca" para as membranas da cavidade remendadas com L-PRF, e a subcavidade foi finalmente preenchida com coágulos de L-PRF. O acompanhamento clínico e radiográfico foi realizado logo após a colocação do implante, após 6 meses, 1 ano e cada ano seguinte. Resultados: Seis meses após a cirurgia, todos os implantes estavam claramente estáveis durante o aperto do suporte. O acompanhamento máximo foi de 6 anos e todos os pacientes foram acompanhados durante o mínimo de 2 anos. Nenhum implante foi perdido durante esta experiência de 6 anos e o ganho de osso vertical foi sempre substancial, entre 8.5 e 12 mm de ganho de osso (10.4 ± 1.2). O nível final da nova superfície da cavidade esteve sempre em continuação com a ponta apical do implante e a altura da crista óssea do peri-implante ficou estável. Conclusão: O uso de L-PRF como único material de enchimento durante a elevação e implantação simultâneas da cavidade parece ser uma opção cirúrgica confiável, promovendo a regeneração natural do osso.

PALAVRAS-CHAVE: implante dentário, fibrina, fibrina rica em plaquetas (PRF), plasma rico em plaquetas (PRP)

RUSSIAN / ПУССКИЙ

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Одновременное проведение синус-лифтинга и имплантации с помощью имплантатов с микронервьёй и L-PRF в качестве единственного трансплантационного материала: шестилетний опыт.

**РЕЗЮМЕ.** Цель. Оценка значимости одновременного проведения синус-лифтинга и имплантации с помощью L-PRF (фибрин с высоким содержанием лейкоцитов и тромбоцитов, методика Шкуруна) в качестве единственного наполнителя дна гайморовой пазухи. Материалы и методы. На 20 пациентах было проведено 23 латеральных синус-лифтинга (SA4 синус) с одновременной установкой имплантата. Для лечения семи пациентов использовались имплантаты Astra (AstraTech, Mölndal, Швеция), для лечения 13 пациентов – имплантаты 33 Intra-Lock (Intra-Lock Ossean, Boca Raton, Флорида, США). Для покрытия шиндельных мембраны использовались мембраны L-PRF, концы стержней имплантатов служили в качестве точек крепления мембран гайморовой пазухи, покрытых L-PRF, дно пазухи окончательно заполнили комочками L-PRF. Клиническое и радиографическое обследование было проведено непосредственно после установки имплантата, через 6 месяцев, через 1 год и каждый последующий год. Результаты. Через шесть месяцев после операции все имплантаты во время затяжки супраструктура оставались клинически стабильными. Максимальный период наблюдения составлял 6 лет, и все пациенты наблюдались в течение как минимум 2 лет. В течение данного шестилетнего периода ни один имплантат не был потерян, увеличение высоты кости во всех случаях было значительным и составляло 8,5 – 12 мм (10,4 ± 1,2). Окончательный уровень нового дна пазухи во всех случаях являлся продолжением верхушки стержня имплантата, а высота альвеолярного гребня вокруг имплантата была стабильной. Вывод. Использование L-PRF в качестве единственного заполнителя при одновременном проведении синус-лифтинга и имплантации является надежным хирургическим методом стимуляции регенерации натурализ костной ткани.

**КЛЮЧЕВЫЕ СЛОВА:** зубной имплантат; фибрин; фибрин с высоким содержанием тромбоцитов (PRF); плазма с высоким содержанием тромбоцитов (PRP)

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**TURKISH / TÜRKÇE**

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Mikro-yivli implantlar ve tek greft materyalı olarak L-PRF kullanılarak eş-zamanlı sinüs kaldırma ve implantasyon: 6 yıllık deneyim.

**ÖZET: Amaç:** Tek sub–sinüs dolgu materyali olarak L-PRF (Lökosit ve plateletten zengin fibrin, Choukroun teknigi kullanılarak eş-zamanlı sinüs kaldırma ve implantasyon işlemi değerlendirilecek. **Gereç ve Yöntem:** 20 hasta 23 adet lateral sinüs kaldırma (SA4 sinüs) işlemi, implant yerleştirme ile eş zamanlı olarak yapıldı. Yedi hasta, 19 adet Astra implantı (AstraTech, Mölndal, İsveç) ile ve 13 hasta 33 adet Intra-Lock implantı (Intra-Lock Ossean, Boca Raton, FL) ile tedavi edildi. Schneiderian membranı kaplamak için L-PRF membranları kullanıldı ve implant uçları, L-PRF ile yama yapılan sinüs membranları için “çafır civisi” işlemi yapıldı. Subsinüs boşluğu son olarak L-PRF pıhtıları ile dolduruldu. Hemen implant yerleştirme sonrasında, 6 ay sonra, 1 yıl sonra ve sonraki her yılta bir kez klinik ve radyografik izlem yapıldı. **Bulgular:** Cerrahiye altı ay sonra abutman sıkıştırma esnasında tüm implantların klinik olarak stabil olduğu görüldü. En uzun izlem dönemi 6 yıl oldu ve hastaların tümü en az 2 yıl boyunca takip edildi. 6 yıl boyunca implant kaybı olmadı ve dikey kemik kazanç daima kayda değer olup, 8.5 ile 12 mm arasında değişti (10.4 ± 1.2). Yeni sinüs tanımını son düsey daima implantın apikal ucuna kadar devam etti ve peri-implant sır kemik yüzeyleşigi stabil idi. **Sonuç:** Eş zamanlı sinüs kaldırma ve implantasyon işlemi sırasında L-PRF’nin tek dolgu materyali olarak kullanılmazsa doğal kemik regenerasyonunu teşvik eden güvenir bir cerrahi seçeneğidir.

**ANAHTAR KELİMELER:** Dental implant, fibrin, plateletten zengin fibrin (PRF), plateletten zengin plazma (PRP)
マイクロスレッドインプラントならびにL-PRFを唯一の移植補填材として用いたサイナスリフト同時インプラント埋入：
6年間の経験知識

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研究概要:
目的: 唯一のサイナス下充填材としてL-PRF（白血球・多血漿版フィビリン；コークラン法）を用いたサイナスリフト同時イン
プラント埋入の妥当性を評価した。

素材と方法: 患者20名に23の側面上顎洞底挿上術（SA4 サイナス）を施行し、同時にインプラントを埋入した。7名の患者に
は19本のAstraインプラント(AstraTech, Möndal, Sweden), また13名の患者には33本のIntra-Lockインプラント(Intra-Lock
Ossean, Boca Raton, FL, USA)を埋入した。シュナイダー膜はL-PRFメンブレンで被い、インプラント先端をL-PRFを当てるサイ
ナス膜の “テントベダ” として利用した。サイナス下空洞は凝固したL-PRFで最終的に補填した。インプラント埋入直後と6
ヶ月目そして1年目に引き続き毎年、臨床ならびにレントゲンによるフォローアップをおこなった。

結果: 術後6ヶ月目アパルメントを締める時点で全てのインプラントは臨床的に安定性を示した。フォローアップ6年間が
最も長いが、全ての患者を最低2年間フォローアップした。6年間の経過でインプラントは1本も失われず、垂直骨組織増加は
8.5から12mmの骨組織増加（10.4±1.2）という常に充分な値を示した。新上顎洞底最終レベルは常時インプラント根尖先端
と同一レベルで、インプラント周辺歯槽頂骨の高さも安定性が確認された。

結論: サイナスリフト同時インプラント埋入で唯一の補填材L-PRFの使用が自然な骨組織再生を促進する信頼性のある外
科的オプションである。

キーワード: デンタルインプラント、フィビリン、多血漿版フィビリン（PRF）、多血小板血漿（PRP)
使用精密細紋植體和 L-PRF 做為同步竇增高和植牙的唯一移植材料：6 年經驗。

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摘要：
目的：評估使用 L-PRF (富血白血球和富血小板纖維蛋白，Choukroun 的技術) 做為同步竇增高和植牙的竇下唯一填充材料的相關性。

資料與方法：為 20 名患者進行 23 個竇向竇增高 (SA4 竇) 並同步植牙。7 名患者以 19 顆 Astra 植體 (AstraTech, Mölnadal, Sweden) 治療，另外 13 名患者則以 33 顆 Intra-Lock 植體 (Intra-Lock Ossean, Boca Raton, FL, USA) 治療。使用 L-PRF 膜覆蓋 Schneiderian 膜，以植體尖端做為 L-PRF 補腫的竇膜的「帳篷橫」，最後在竇下翻修骨腔使用 L-PRF 凝塊填充。在植牙之後 6 個月 - 1 年和此後每年進行臨床和 X 光攝影追蹤。

結果：外科手術六個月後，所有植物體在鎖緊支柱牙期間都具有臨床穩定性。追蹤時間最長達 6 年，所有患者則至少追蹤 2 年。在 6 年追蹤經驗中，沒有損失任何植體，而且垂直骨始終有明顯增加，幅度從 8.5 至 12 mm (10.4±1.2)。新竇底的最後高度始終延續植體頂端延伸，植體周圍牙骨質高度則保持穩定。

結論：使用 L-PRF 做為同步竇增高和植牙期間的唯一填充材料似乎是一個促進自然骨質再生的可靠外科手術選項。

關鍵字：牙科植體、纖維蛋白、富血小板纖維蛋白 (PRF)、富血小板血漿 (PRP)。